This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.

+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.

+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.

+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`

LANE MEDICAL LIBRARY STANFORD
2 45 0441 3266

OFFICIAL TRANSACTIONS

OF

NATIONAL ASSOCIATION

OF

RAILWAY SURGEONS

[illegible]

ESTABLISHED 1859.

Chas. Schleiffarth . . .

MANUFACTURER OF

Trusses AND

Orthopædic

Instruments,

ELASTIC STOC AND BELTS,

No. 608 N. Fourth Stre Louis, Mo.

LANE

MEDICAL LIBRARY

SEAL OF THE LELAND STANFORD JUNIOR UNIVERSITY

1885

EXCHANGE

College of Medicine,
University of Nebraska.

AMBU CES.

THE MO ADE.

ABSOLUTELY NO JAR OF ANY KIND TO PATIENT.

IN USE BY

MISSOURI PACIFIC RAILWAY HOSPITAL SERVICE;
ST. LOUIS, MO., HEALTH DEPARTMENT;
MILWAUKEE HOSPITAL
AND MANY OTHERS.

WRITE FOR PHOTOGRAPHS AND FURTHER INFORMATION TO

The SAUERBRUNN CARRIAGE AND WAGON COMPANY,

1627 and 1629 CLARK AVE. and 218 SOUTH 17th STREET,

ST. LOUIS, MO.

DePew Operating and Examining Chair.

R. BOERICKE & CO.

MANUFACTURERS AND DEALERS IN

OPERATING CHAIRS AND TABLES,

Physician's Cabinets, Dentists' Cabinets, Self-Propelling Invalid Chairs, Patent Rolling Chairs, Reclining Chairs, Invalid Couches, Hospital Wheel Tables, Commodes, Improved Crutches, and all kinds of Mechanical Appliances for the alleviation of the suffering.

495-503 WELLS STREET, CHICAGO, ILL.

Received the only Gold Medal Awarded at New Orleans Centennial Cotton Exposition, and North, Central and South American Exposition, A. D. 1885-6, against all competitors. Send for descriptive circular.

THE Railway Age AND NORTHWESTERN RAILROADER.

IS READ WEEKLY BY MORE THAN

1,000 Railway Surgeons

AND BY MORE THAN

5,000 OTHER RAILWAY MEN,

Including the majority of the Presidents and General Managers of all roads in the country.

TO EACH OF THESE OFFICIALS IT IS A

CONSTANT WEEKLY REMINDER

OF THE IMPORTANCE OF THE

National Association of Railway Surgeons,

And the good work which it is doing for the Railway Service.

H. C. SAMPLE . . .

MANUFACTURER OF

Physicians' Electric Supplies

145 ONTARIO STREET,

TELEPHONE 824 NORTH. **CHICAGO.**

Cathartica

BAKER

AN ACTIVE LIQUID CATHARTIC

ESPECIALLY DESIGNED TO MEET THE REQUIRMENTS OF AN AGREEABLE LIQUID PURGATIVE FOR LADIES AND CHILDREN

ADULT DOSE: ONE TO TWO TEASPOONFULS

ORIGINATED AND MADE BY CHAS. S. BAKER & CO.

PHARMACISTS AND CHEMISTS

CHICAGO, ILLINOIS.

THE NATIONAL

Association of Railway Surgeons.

Official Report of the Fifth Annual Meeting,

HELD AT

Old Point Comfort, Va.

May 25 to 28, 1892.

EDITED BY
R. HARVEY REED, M. D.
MANSFIELD, OHIO.

PUBLISHED BY
The Railway Age and Northwestern Railroader,
CHICAGO, ILL.

CONTENTS.

CHAPTER I.

REPORT OF MEETING.

Minutes, with Reports of Officers and Committees................. 9-23
President's Address—The Objects and Benefits of the National Association of Railway Surgeons. By Surgeon J. H. Murphy, St. Paul, Minn.. 23-25

CHAPTER II.

THE SURGICAL SERVICE.

The History of Railway Surgical Organizations. By Surgeon C. P. Stemen, Ft. Wayne, Ind.......... 26-31
Organization of a Railway Surgical Department. By Surgeon W. H. Elliott, Savannah, Ga..................... 31-36
Costs and Compensations. By Surgeon G. P. Conn, Concord, N. H. 36-43
Union Hospital Plan. By Surgeon E. R. Lewis, Kansas City, Mo.. 43-46
The Care of the Injured by the Pennsylvania Railroad. By Surgeon I. P. Klingensmith, Blairsville, Pa 46-53

CHAPTER III.

CRANIAL INJURIES.

Surgical Treatment of Brain Injuries. By Surgeon Charles H. Merz, Sandusky, Ohio................ 54-61
Cranial Injuries, with a Report of a Case. By Surgeon Joshua Chitwood, Connersville, Ind.............................. 61-69
Cranial Injuries, with Cases. By Surgeon W. A. Ward, Conneaut, O. 69-72

CHAPTER IV.

SPINAL INJURIES.

Treatment of Fracture and Dislocation of the Spine. By Surgeon Albert I. Bouffler, Chicago, Ill................................ 73-88
Trainman's Back. By Surgeon J. N. Hall, Sterling, Col........... 88-91
Diagnosis and Prognosis in Surgical Lesions of the Spinal Cord and Its Coverings. By Surgeon Thomas H. Manley, New York, N. Y....... 91-104
Operations for Injuries to the Spinal Column and Cord. By Surgeon E. M. Robinson, Bessemer, Mich........................ 104-105

63948

CHAPTER V.

NEUROTIC DISORDERS.

Hypnotic Suggestion and Its Relation to the Traumatic Neuroses. By Surgeon J. H. Green, Dubuque, Iowa 106–113

CHAPTER VI.

MEDICO-LEGAL QUESTIONS.

Legal Points for Railway Surgeons. By Surgeon H. B. Tanner, Kaukauna, Wis 114–117
Death from Shock, from a Medico-Legal Standpoint. By Surgeon O. D. Fitzgerald, Los Angeles, Cal 117–122
Shock in Railway Injuries and the Fatality of Too Early Operation. By Surgeon R. L. Payne, Jr., Lexington, N. C. 122–125

CHAPTER VII.

INJURIES OF THE EYES AND DEFECTS OF THE VISION.

Injuries of the Eye Among Railway Employes. By Surgeon Joseph A. White, Richmond, Va 126–133
Color Blindness, Its Detection and Correction. By Surgeon James L. Minor, Memphis, Tenn 133–135

CHAPTER VIII.

FRACTURES AND DISLOCATIONS.

A New Appliance for Fractured Clavicle. By Surgeon Jesse Hawes, Greeley, Col 136–140
The Treatment of Fractures of the Elbow. By Surgeon W. H. Buechner, Youngstown, O 140–144
Treatment of Simple Fractures Involving the Articular Surfaces of the Condyles of the Humerus. By Surgeon Charles W. Rook, Quincy, Ill 144–146

CHAPTER IX.

AMPUTATIONS.

Double Synchronous Amputation. By Surgeon Lester Keller, Buery, W. Va 147–149
A Record of 264 Amputations, with Deductions. By Surgeon Wm. L. Estes, South Bethlehem, Pa 149–156

CHAPTER X.

ANÆSTHETICS.

Local Anæsthesia. By Surgeon Alexander J. Mullen, Michigan City, Ind 157–159
Chloroform or Ether? By Surgeon D. W. C. Wade, Holly, Mich.... 159–161

CHAPTER XI.

ANTISEPTICS.

Aseptic and Antiseptic Methods in Railway Surgery. By Surgeon Oscar J. Price, Chicago, Ill........ 162–170
Caution in Regard to the Use of Bichloride of Mercury in Wounds. By Surgeon Samuel Birdsall, Susquehanna, Pa........ 170–173

CHAPTER XII.

SUPPLIES FOR THE SERVICE.

A Better Ambulance Service. By Surgeon C. McV. Toby, St. Paul, Minn........ 174–176

CHAPTER XIII.

MISCELLANEOUS SUBJECTS.

An Experimental Enquiry Concerning Elastic Constriction as a Hæmostatic Agent. By Surgeon Nicholas Senn, Chicago, Ill... 177–185
The Healing of the Contused and Lacerated Wounds from Railway Injuries. By Surgeon W. B. Outten, St. Louis, Mo........ 185–190
The Value of Blood Clot for Dead Spaces. By Surgeon Samuel C. Benedict, Athens, Ga........ 190–194
Syphilis in Relation to Railway Employes and Passengers, with Cases. By Surgeon Hugh F. Nelson, Charlottesville, Va........ 195–204
Two Interesting Cases of Railway Injuries. By Surgeon Webb J. Kelly, Galion, O........ 204–208
Railroad Dust in Railroaders' Noses. By Surgeon Hanau W. Loeb, St. Louis, Mo........ 208–211
Traumatic Synovitis. By Surgeon W. T. Williams, Mount Carmel, Pa........ 211–214

APPENDIX.

Roll of Active Members........ 215–233

CHAPTER I.

NATIONAL ASSOCIATION OF RAILWAY SURGEONS.

Fifth Annual Meeting, Held at Old Point Comfort, Va., May 25, 26, 27 and 28, 1892.

[Officially Reported by Dr. William Whitford, Medical Stenographer, Chicago, Ill.]

FIRST DAY.

The association convened in the Hall of the Hygeia Hotel, and was called to order by the chairman of the committee on arrangements, Dr. C. W. P. Brock, of Richmond, Va., at 3 P. M., May 25th. The president, Dr. J. H. Murphy, of St. Paul, Minn., invited all the ex-presidents and vice-presidents to take seats on the platform.

Divine blessing was invoked by the Rev. Dr. J. J. Gravatt, rector of St. John's Church, Hampton.

WELCOMING ADDRESS.

The address of welcome was then delivered by Dr. C. W. P. Brock, of Richmond, as follows :

Mr. President and Gentlemen of the National Association of Railway Surgeons:

As chairman of the committee of arrangements I have the honor and pleasure of extending to you a most cordial welcome to Virginia. A word of explanation just here. When you were invited to hold this meeting at the Hot Springs in this state I believed that the improvements being made there would have been so far completed as to have furnished comfortable accommodations to our members, but finding that such would not be the case, the executive committee fixed upon this as the place of our convention. I had hoped to be able to show you that beautiful valley and the wonderful provisions of nature existing there for the healing of the sick, but this must be postponed to some future occasion.

You are here in the most historic section of the historic Old Dominion. Right along up these waters—possibly not a hundred yards from where we are assembled—John Smith sailed along with Capt. Newport, and effected a landing and made a settlement at Jamestown island in the James river, almost in sight from this point, and from there went forth to conquer, civilize and christianize a continent. Here too was struck the first blow by the colonists against the oppressions of the British government, led by Nathaniel

Bacon, and resulting in putting to flight the cruel colonial governor—Berkeley, and the destruction of his capital. Williamsburg—about an hour by rail from here—in time thereafter became the capital of the colony. There the patriots Washington, Jefferson, Mason, Harry Lee and their associates met, formulated and made known their demands to Great Britain, and from there issued the American Bill of Rights—the magna charta of our country—penned by George Mason. And Yorktown, in this immediate vicinity, marked the end of the Revolutionary war, and the independence of America by the surrender of Cornwallis to our immortal Washington. But for the part Virginia bore in these eventful times, it is probable that the United States would never have had a place among the first nations of the world. She too bore the most conspicuous part in the formation of the government, and gave to our country many of our wisest statesmen.

Though the foundations of the new republic were laid broad and deep by master-hands, still some crevices were left in which the seeds of discord and discontent found a lodgment and which in time took root and grew, and threatened to disrupt and destroy the handiwork of our fathers. It took an ocean of the best blood of the land to destroy these roots of bitterness, and to cement anew this union of indestructible states. The war that had been waged so bitterly at the forum was transferred to the field, and when American met American then came the tug of war. Virginia, which had been so conspicuous in the formation of the Union, now became the battlefield, and for four years bore the brunt of the terrible civil conflict. There was not a county in the state that was not the scene of some clash of arms, and several of more than one fearful battle, and these waters just before you are memorable as being the spot where the Merrimac, (or Virginia, as she had been christened) and the Monitor tried conclusions—the first two iron-clads that had ever met in battle. This fight revolutionized the naval warfare and naval architecture of the world.

As in all civil wars, so in ours, human passions were stirred to their deepest depths, yet to the everlasting honor and credit of the surgeons be it said, that there never was an instance in which they were unmindful of their high calling, and so far forgetful of duty as to neglect or be unkind to a sick or wounded soldier whether he were friend or foe. This is almost a God-like record, and should place the fame of these men in the highest niche of the temple of humanity.

If the great interests which we in part represent here to-day had had an existence in the fifties I do not believe that we would ever had our mighty civil conflict. These great lines of railway extending from north to south and from east to west, binding the country together by veritable bands of steel, making intercourse between the different sections rapid and inexpensive, are having the effect of uniting our people as nothing else could. A community of interests is being created; they know each other better, respect each other more, recognizing the fact that there is good in all, and that no section has a monopoly upon patriotism and good citizenship.

The Hon. Amos J. Cummings, a Union soldier, in a speech recently delivered in congress, said in regard to our civil war:

> On both sides it was urged from the highest motives of patriotism and of honor, and in defense of the popular principle. That principle with us means local self-government and representative union. The rebel yell was because they thought local government in peril. The federal huzza was for representative union. Together they were cheering the same deeply-imbedded sentiment.
>
> Those who would study the phenomenon must remember that where opinions approximate on parallel lines, but from some interest or sentiment refuse to coalesce, the passions are liable to ignite. Fusion then takes place in a terrible heat. The heat must be sufficient to remove the obstacle that the mass may become unified. We have as a result a firmly established representative union of local self-governments. The cooling and finishing process has left no flaw. Sir, what sort of a soldier must he be who is not proud of having been tempered in such a trial? If after the unmatched tournament this is not the spirit of victor and vanquished, then the lights of chivalry are burnt out and magnanimity is no more.

Hear also the recent utterances of a great southern soldier, Gen. John B. Gordon. He says:

> The old order has passed and a new era has come. Blended now in one common citizenship and in one American brotherhood are the brave veterans of those vast armies which once met and grappled each other in deadly combat, now and forever united in the ennobling pursuits of peace; and with their faces turned to the promising and pregnant future, they are resolved by their joint efforts to achieve for their common country a destiny higher and grander, if possible, than was ever anticipated or even hoped for by the founders of the republic. The highest, the sole political ambition of those disbanded veterans of the confederacy is to promote the welfare of their commonwealth and to see this union of coequal states progressive, prosperous, perpetual and forever free.

When such sentiments as these are entertained by those who were once soldiers on opposite sides, then indeed is the wound healed and the cicatrix firm and unyielding. When the real soldiers feel thus all attempts to excite sectional feeling by those who have been fitly characterized "as invisible in war but invincible in peace," must utterly fail.

All history teaches that no nation has arisen to the height of its prosperity and grandeur till it has passed through the furnace of affliction, and it is also said that you love a man more after you have fought him. Both history and the aphorism are being verified in our experience. Our country has grown greater and grander than ever, and the good feeling existing between all our people now marks an era hitherto seemingly unattainable.

The ruin and desolation that fell upon Virginia by reason of our late unpleasantness can not be described. Her sons who had shown such splendid courage and heroism in honorable warfare still clung to their old mother—loving her more, if it were possible, in her devastation and desolation than in the days of her brightest prosperity, and sang with the poet-priest:

Yes! give me a land where the ruin is spread,
And the living tread light on the hearts of the dead;
Yes, give me the land where the battle's red blast
Has flashed on the future the frown of the past;
Yes, give me the land that hath legend and lays
That tell of the memories of long vanished days;
Yes, give me the land with a grave in each spot,
And names in the graves that shall not be forgot;
Yes, give me the land of the wreck and the tomb,
There's a grandeur in graves—there's a glory in gloom,
For out of the gloom future brightness is born,
As after the night, looms the sunrise of morn.

And they were right. The sun of prosperity has arisen and the recuperation that has blest the honest toil of our people has no parallel in history. From the most abject poverty, all lost save hope and honor, Virginia stands before you to-day, gentlemen, "fair as the morn, clear as the sun," but no longer "terrible as an army with banners." She graciously acknowledges the timely assistance she has again and again received from the people of the north, and receives you, as she receives all good men, with open arms.

My brethern of a common country, speaking the same language, the same hopes and fears animating us, the same destiny awaiting us, the same emblem waving over us; fellows of a common profession, loving one another, loving country, loving home, loving humanity and loving God, I bid you welcome, thrice welcome to our hearts, to our homes and to our Virginia!

The address was received with long continued applause, and a response was made by President Murphy, who spoke as follows:

Gentlemen of the Association:

Such an address as we have just listened to fills me with enthusiasm, so that I hardly know where to commence. When I look at this vast congregation of railway surgeons assembled here to-day in comparison with a few years ago when we met in Chicago, then a mere handful of men, I cannot find suitable language to express my feelings. When we met in Chicago to consider the propriety of establishing such an association it was doubtful in the minds of some whether it could ever be sustained. But fortunately the majority ruled and we started it. The old surgeons of the army who went through the war of the rebellion had bullet and shell wounds to treat, but that time has passed and we hope never to return. [Applause.] Another class of surgery has sprung up since that time, a different class of injuries altogether—railroad injuries. Our railroads are extending to and from all parts of America—yes, in almost every nook and corner of this great country you will find a railroad. Through the able management of the committee of arrangements we have at this meeting the largest number of railway surgeons in the history of the association. [Applause.] Through the efforts of Dr. Brock and Mr. George W. Stevens, manager of the C. & O., and the managers of other roads, our members have been transported long distances and we have been received here in old Virginia with open arms. [Applause.] I remember very well during the war when we tried hard to get to Richmond, but we could not do it. [laughter]; but yesterday we had no trouble whatever to get there. Since we left our homes we have had everything that our hearts could wish, and there is nobody more thankful to the committee of arrangements than your humble servant for the magnificent way in which we have thus far been entertained. Our committee on transportation has done equally good service. My friend, Dr. Outten [applause], has written not to one, but to every railroad in America, and all of the roads except one [hisses] have said: "We will give you transportation; you belong to us and we belong to you." [Applause.] (At this juncture Mr. George W. Stevens, manager of the C. & O. railway, entered the hall, his entrance being the signal for an outburst of applause.) It makes me feel proud to see such a large body of men here to-day. We struggled along for a year or so and did not succeed very well until we convinced the railroad officials of this country that we were working and meeting annually for their interests and the interests of thousands—yes, millions—of people who travel daily over the various railroads of this great, ever progressive and cosmopolitan country. [Applause.] Is it not a fact that hardly a day passes but what we have men under our care, from the president of the United States down to the lowest section man on the road? And it is essential that we meet together and talk over matters in order to know how best to treat the injured. They have got to be treated, and the better they are treated the better for the railroads and the better reputation the railroad surgeon will have. It is absolutely necessary that we exchange ideas and discuss the best methods for the benefit of those who are injured on our roads. We do not want long, tedious papers; we need practical demonstrations every year how best to treat the injured. [Applause.]

Gentlemen, we started with about 80 members. What have we to-day? A little over 1,200 "paid up" members of our association. Think of it! Let us work harmoniously together, and we have nothing to fear. I expect before long our membership will reach 3,000, and I shall be proud of it. I have never seen a more intelligent and able body of men than I see before me to-day, and I defy contradiction. As for the women, I have never seen a finer lot than are assembled here this afternoon. [Laughter and applause.] But, gentlemen, our time is valuable, and I will detain you no longer.

At the conclusion of President Murphy's remarks Mr. G. W. Stevens, general manager of the C. & O., was called upon for a speech, and spoke briefly and appropriately.

PRELIMINARY BUSINESS.

Dr. Brock, as chairman of the committee of arrangements, announced that on Friday afternoon a complimentary excursion to the Capes would be given to the association by the Chesapeake & Ohio railway company on the steamer "Louise," which would leave the Old Point landing at 1 P. M.

The president appointed as the committee on nominations the following named: Dr. W. B. Outten, St. Louis, Mo., chairman; Dr. S. Marks, Milwaukee, Wis.; Dr. O. D. Fitzgerald, Los Angeles, Cal.; Dr. J. J. Buchanan, Pittsburgh, Pa.; Dr. A. A. Thompson, Waxahachie, Tex.; Dr. Wm. H. Elliott, Savannah, Ga.; Dr. J. M. Dinnen, Fort Wayne, Ind.

The reading of papers was then proceeded with, and the first paper read was by Dr. Hugh T. Nelson of Charlottesville, Va., entitled "Syphilis in Relation to Railway Employes, with Cases."

Dr. W. A. Phillips of Salina, Kas., moved that the surgeons of the Army, Navy, Marine Hospital Corps, Indian School and Soldiers Home be made members by invitation. Carried.

Dr. Joseph Chitwood of Connersville, Ind., read a paper on "Cranial Injuries, with the Report of a Case." Discussed by Drs. George A. Baxter of Tennessee, E. Griswold of Pennsylvania, J. W. Young of Iowa, E. S. Lanphear of Missouri, W. A. Phillips of Kansas, J. B. Murdoch of Pennsylvania, M. T. Williams of Pennsylvania, Milton Jay of Chicago, W. B. Outten of Missouri, S. S. Thorn of Ohio, and discussion closed by the essayist.

Dr. M. T. Williams of Mt. Carmel, Pa., followed with a paper on "Traumatic Synovitis."

Dr. C. B. Stemen of Fort Wayne, Ind., read a paper on "The History of Railway Surgical Organizations." Discussed by Drs. E. Griswold and Outten.

On motion the association adjourned till 10 A. M. Thursday.

SECOND DAY—Morning Session.

The association met at 10 A. M., and was called to order by the president.

Dr. Samuel C. Benedict of Athens, Ga., read a paper entitled "The Value of Blood Clot for Dead Spaces."

Dr. Joseph A. White of Richmond, Va., read a paper on "Injury of the Eye Among Railway Employes." Discussed by Dr. A. C. Graves of Cherokee, Kan.

A paper by Dr. C. McV. Tobey of St. Paul, Minn., entitled "A Better Ambulance Service," was read by title.

Dr. W. H. Elliott of Savannah, Ga., read a paper on "Organization of Railway Surgical Departments."

Dr. I. P. Klingensmith of Blairsville, Pa., followed with a paper entitled "The Care of the Injured by the Pennsylvania Railroad."

The two papers were discused conjointly by Drs. Outten, W. H. Elliott, W. A. Phillips, J. B. Murdoch, C. H. Hughes (St. Louis), Geo. Ross of Richmond, and G. J. Northrop of Marquette, Mich.

Dr. W. B. Outten read a paper entitled "The Healing of Contused and Lacerated Wounds from Railway Injuries." Discussed by Dr. Samuel C. Benedict of Athens, Ga.

Dr. Brock introduced Dr. Hunter McGuire of Richmond, Va., to the association, who made a few appropriate remarks.

Dr. Jesse Hawes of Greeley, Colo., read a paper entitled "A New Appliance for Fracture of the Clavicle." Discussed by Drs. Griswold and Jay.

Adjourned till 2 P. M.

SECOND DAY—Afternoon Session.

The association re-assembled at 3 P. M. Secretary Lewis read the report of the executive committee, as follows:

REPORT OF EXECUTIVE COMMITTEE.

Pursuant to a call of the chairman, the executive committee met at the Grand Pacific hotel, Chicago, March 21, 1892, the following members being present in person or by proxy: Dr. B. F. Wilson, C. & A., Slater, Mo.; Dr. J. M. Dinnen, N. Y. St. L. & C., Fort Wayne, Ind.; Dr. A. A. Ames, M. St. P. & S. S. M., Minneapolis, Minn.; Dr. C. W. P. Brock, C. & O., Richmond, Va.; Dr. J. W. O'Connor, D. & R., Denver, Col.; Dr. C. K. Cole, Mont. Cent., Helena, Mont.

The report of the committee on publication, which met at the same time and place, was submitted to the executive committee, who confirmed it and recommended that the dues for 1892-3 be placed at four ($4.00) dollars, which should include the expense account for the year, a volume of the Transactions of the fifth annual meeting and a weekly copy of the *Railway Age and Northwestern Railroader*, and authorized the treasurer to prepare registration blanks for the fifth annual meeting in accordance with same. All of which is very respectfully submitted.

C. K. COLE, *Chairman*,
J. W. O'CONNOR,
A. A. AMES,
C. W. P. BROCK,
B. F. WILSON.

On motion of Dr. Montmollin the report was accepted and adopted.

The report of the treasurer followed:

TREASURER'S REPORT.

I beg leave to submit the following report for the year commencing June 1, 1891, and ending May 31, 1892.

CENSUS OF MEMBERS.

Dropped for non-payment of dues, as per constitution	73
Deceased members	31
Members who owe for 1891 and have refused to pay	29
Members from whom no reply has been received	22
Members discontinued at their own request without explanation	21
Members who left the service and were discontinued at their own request	16
Total exemption from the roll for all causes	192
Members in good standing who have paid up their dues in full to June 1, 1892	1,236

At the beginning of the year we found a great many of our members in arrears for dues. Of a total enrollment of 423, there were but 282 members at the close of the Buffalo meeting who had paid up their dues in full to June 1, 1892, and many of those owed for two and three years.

Your treasurer set out at once to put into effect the constitution governing the collections of the dues, which required him to collect all dues and give his receipt for the same, and drop such from the roll of members who were in arrears two years and who failed or refused to pay after being duly notified. Accordingly a statement of every member's account was mailed him June 1st, July 1st and August 1st, while those who had still neglected to pay by September 1st, after being duly notified, were drawn on through the bank, and all those who did not honor the drafts and who were in arrears for dues for two years or more, were promptly dropped from the roll of members for "non-payment of dues," and were notified by letter of the same.

As the contract with the Railway Age Company was made on a cash basis, no member was sent the journal who had not paid his dues in full to June 1, 1892. Those members who refused to pay for 1891 were looked upon as members who were not in good standing on account of this delinquency, and were not sent the journal or the annual membership certificate for the reason above stated.

FINANCES.

The receipts for the year are as follows, by months: May, $882; June, $444; July, $511; August, $552; September, $567; October, $207; November, $74; December, $88; January, $57; February, $81; March, $165; April, $276; May, $354; making a total of $4,258. This sum was paid by 1,243 members. It should be remembered that at the beginning of the year there were quite a number of members who owed for two and three years, including their dues for 1891, and of the entire number there were seven members who paid up in full to June 1, 1891, and were "discontinued at their own request," leaving a net paid up membership to June 1, 1892, of 1,236.

DIVISION OF ACCOUNTS.

According to the instructions of the executive committee, confirmed by the association at the Buffalo meeting, the entire receipts were divided into two accounts, namely, the journal and the expense account. Two-thirds of all the receipts were charged to the journal account and one third to the expense account.

There has been charged to the journal account during the year $2,838.66⅔. Of this sum Dr. C. B. Stemen has been paid $612.33⅓, the Railway Age Company was paid $2,226.33⅓, making a total of $2,838.66⅔, and with the deficiency added in, a grand total of $3,084.33⅓ for Journal expenses during the fiscal year ending May 31, 1892.

Owing to the failure to collect the amount of dues claimed by Dr. Stemen for publishing the Journal of the National Association of Railway Surgeons, in the settlement at Buffalo, there was a deficit created in the Journal account amounting to $245.66⅔, which had to be supplied to the Journal account from the expense account, in order to satisfy the contracts the publishers held against the association.

It will be observed by the statement herewith attached there was a balance of $194.10 to the credit of the expense account from last year, which added to the $1,419.33⅓ received by the expense account during the year, makes a total of $1,613.43⅓. There was paid during the year for sundry expenses, an itemized account of which will be found in the treasurer's book, and in the receipted bills, on file with the treasurer, the sum of $1,022.60. After transferring $245.66⅔ to the Journal account, there is still a balance left in the hands of your treasurer amounting to $345.16⅔.

The Railway Age Company, according to their contract, furnished 1,236 members with their Journal, at the rate of $2.00 each, amounting in all to $2,472.00, for which they have been paid in full.

Your treasurer supplied himself with a book of blank receipts with stubs; the receipts and stubs were both numbered to correspond, commencing with one and running to and including 1,029, but finding this inadequate, a second book was procured, which numbered from 1,030 to 1,236. Of those receipts, one was spoiled in the filling and was cancelled, seven were used for those who only paid up to June 1, 1891, and were discontinued, and the rest were all used and still we were eight short.

A neat lithographic plate for letter-heads was procured a few years ago, which is so arranged as to be revised each year to suit the newly elected officers and their addresses. Of these letter-heads we supplied each officer with the requisite number, together with suitable envelopes to supply the demands of his office.

Blank vouchers with stubs, both of which were numbered and bound in convenient books, were procured for the secretary, and no bills were paid by the association except by a voucher issued by the secretary after said bills for which the voucher was issued had been audited by the chairman of the executive committee and the secretary.

Lithographic plates were procured of W. J. Morgan & Co. for the membership certificates with which you are all familiar, and 1,400 certificates secured, of which there are but a few remaining unused.

At our request, Messrs. W. J. Morgan & Co. prepared very tasty certificates for the honorary members from a lithographic plate, and printed us 200 certificates, of which we used 40 and have 160 on hand for future use.

A quantity of suitable blanks were printed for notifying the members of their dues and arrearages, which were filled in with the name and address of the member, together with the amount of his dues, and mailed to him (in sealed envelopes) the first of each month for four months in succession unless he remitted before for the same.

Suitable circulars were prepared, setting out the objects of the association and giving the place of the coming meeting, etc., inviting railroad surgeons who were not members of the association to unite with it and give it their influence and aid; these were mailed to quite a large number of surgeons throughout this country, as well as the dominion of Canada and the republic of Mexico. We are pleased to say these circular invitations were very promptly responded to by a large number of surgeons, who not only cast their lot with us but used their influence for the advancement and welfare of the association and the increase of the membership, on the merits of its aims and objects, as they nearly always expressed it.

In consultation with the members of the executive committee and other officers, after assuming the newly added duties of this office at the close of the Buffalo meeting, it was unanimously decided to adopt the cash policy as the only safe and reliable business method of conducting the financial business of an association such as this, which has representatives (as will be seen by the appendix to this report) in almost every state and territory in the Union, besides Canada and Mexico.

Consequently, after giving each member due notice and allowing him from four to six weeks to pay up his dues, the Journal was stopped unless dues were paid in full to June 1, 1892, until they *were* paid, when his Journal was again promptly started and will be continued until the end of the fiscal year and as much longer as may be deemed necessary to give him ample time to settle his dues for the coming year, when it will be stopped until said dues are paid.

Likewise the annual membership certificates were not issued except to those who had paid their dues in full to June 1, 1892, at which time their certificates will expire, and as promptly after as practicable a new certificate will be issued for the ensuing year to those who have paid up their dues in full to June 1, 1893.

It seems to me that it is useless to offer any argument in support of this policy, as it embraces nothing but plain business principles, which no practical business man should hesitate to indorse.

GENERAL REMARKS.

When it is taken into consideration that our association had only 282 paid up members at the close of the Buffalo meeting, and in addition to this was several hundred dollars in debt, and that the membership has been increased during the year to 1,236 paid up members, an increase of considerably over 400 per cent, or an average monthly increase of almost 80 members, and that all expenses connected with this increase of membership, the collecting of the dues, the publishing of the Journal and other necessary expenses have been paid, in addition to paying off this old indebtedness, and we still have a balance on hand to commence the new year with amounting to $345.16, we feel that we can say to each member that the National Association of Railway Surgeons, if never before, is certainly now, on a firm financial basis, with a membership that is second to no other surgical association in the world, and that with proper management it should be one of the most influential organizations of its kind in this or any other country.

RECOMMENDATIONS.

With a view of enhancing the interest and prosperity of our association, we would in conclusion recommend:

1st. That the cash policy adopted should be continued, and that membership certificates be issued to those members only who pay their dues in full to June 1, 1893.

2d. That the Journal be discontinued, except at the risk of the publishers, in the case of each and every member who fails to pay his dues within a month or six weeks after the beginning of the fiscal year.

3d. That annual membership certificates be issued in the same manner and after the same style as last year, and that each new honorary member be issued a certificate notifying him of his election as soon as practicable after the annual election.

4th. That the treasurer be requested to continue to render a weekly report of the names and addresses of the new members, and make a monthly statement the first of each month of the amount of cash received for the month just passed.

5th. That in view of the fact your treasurer receives no compensation for this work, but does it all "free gratis" for the good of the cause, each and every member resolve himself into a committee of one to assist him in the prompt dispatch of his duties. Very respectfully submitted,

(Signed) R. Harvey Reed, *Treasurer.*

APPENDIX TO TREASURER'S REPORT.

TABLE OF MEMBERS BY STATES.

Alabama, 11; Arkansas, 23; Arizona, 2; California, 6; Colorado, 28; Connecticut, 3; District of Columbia, 2; Delaware, 0; Florida, 8; Georgia, 19; Idaho, 1; Indian Territory, 3; Illinois, 96; Indiana, 75; Iowa, 88;

Kansas, 76; Kentucky, 8; Louisiana, 5; Maine, 0; Maryland, 7; Massachusetts, 0; Michigan, 61; Minnesota, 44; Mississippi, 28; Missouri, 105; Montana, 11; Nebraska, 56; Nevada, 0; New Mexico, 3; New Hampshire, 4; New Jersey, 2; New York, 43; North Carolina, 16; North Dakota, 9; Oklahoma, 2; Ohio, 86; Oregon, 5; Pennsylvania, 97; Rhode Island, 2; South Carolina, 14; South Dakota, 17; Tennessee, 7; Texas, 55; Vermont, 2; Virginia, 18; Washington, 8; West Virginia, 22; Wisconsin, 43; Utah, 5; Wyoming, 3; Canada, 3; Mexico, 3. Total, 1,236.

A CONDENSED STATEMENT OF THE ASSOCIATION'S FINANCES.

Treasurer's Account, May 31, 1892:

To total amount of cash received for the year	$4,258.00	
By Journal account		$2,838.66⅔
By expense account		1,419.33⅓
Total	$4,258.00	$4,258.00

JOURNAL ACCOUNT.

To cash received from treasurer's account	$2,838.66⅔	
To cash transferred from expense account to meet deficiency	245.66⅔	
By cash in full to Dr. C. B. Stemen, for old account of Journal		$612.33⅓
By Railway Age Company, as per contract, for publishing Journals		2,472.00
Total	$3,084.33⅓	$3,084.33⅓

DR. C. B. STEMEN'S ACCOUNT.

Ay amount claimed for arrearages on Journals for 1889 and 1890		$588.00
By additional account for Journals for 1890		21.00
By Journal account for Dr. Jenkins		3.33⅓
To cash in full	$612.33⅓	
Total	$612.33⅓	$612.33⅓

RAILWAY AGE ACCOUNT.

By 1,236 Journals, at $2.00 each		$2,472.00
To cash in full to date	$2,472 00	
Total	$2,472.00	$2,472.00

EXPENSE ACCOUNT.

To cash on hand	$194.10	
To total cash received from treasurer's account	1,419.33⅓	
By sundry expenses		$1,022.60
By transfer to meet deficiency in Journal account		245.66⅔
Balance in hands of treasurer		345.16⅔
Total	$1,613.43⅓	$1,613.43⅓

All of which is very respectfully submitted.

R. Harvey Reed, *Treasurer.*

On motion the treasurer's report was adopted, and a vote of thanks extended to Dr. Reed for his efficient work, and the report ordered published in the printed minutes.

Dr. Reed thanked the association for the honor it had conferred upon him in a brief, appropriate speech.

Dr. Brock moved (as an amendment to by-laws) that the time of holding the annual meeting be left entirely in the hands of the executive committee. The motion was carried by a two-thirds vote.

Vice-president Dr. Geo. Ross took the chair, and President Murphy's address was read by the secretary.

Dr. G. P. Conn, of Concord, N. H., read a paper entitled "Costs and Compensations." Discussed by Dr. R. Harvey Reed.

Dr. G. M. Dewey, of Keytesville, Mo., read a poem on "Railway Spine."

Dr. H. B. Tanner, of Kaukauna, Wis., followed with a paper on "Legal Points for Railway Surgeons."

Dr. O. D. Fitzgerald, of Los Angeles, Cal., read a paper entitled "Death from Shock, from a Medico-Legal Standpoint."

On motion, the association adjourned till 9 A. M., Friday.

THIRD DAY—Morning Session.

The association met at 9 A. M., and was called to order by the president.

ELECTION OF OFFICERS.

The report of the nominating committee, which was read by the chairman, Dr. Outten, was as follows:

We, your committee, beg leave to report the following nominations—

President	Dr. C. W. P. Brock	Richmond, Va.
First Vice-President	Dr. C. B. Stemen	Fort Wayne, Ind.
Second Vice-President	Dr. A. A. Thompson	Waxahachie, Tex.
Third Vice-President	Dr. W. R. Nugent	Oskaloosa, Ia.
Fourth Vice-President	Dr. J. B. Murphy	Chicago, Ill.
Fifth Vice-President	Dr. H. K. Ainsworth	Los Angeles, Cal.
Sixth Vice-President	Dr. A. J. Mullen	Michigan City, Ind.
Seventh Vice-President	Dr. G. J. Northrop	Marquette, Mich.
Secretary,	Dr. E. R. Lewis	Kansas City, Mo.
Assistant Secretary	Dr. Jabez N. Jackson	Kansas City, Mo.
Treasurer	Dr. R. Harvey Reed	Mansfield, O.
Executive Committee:	Dr. B. F. Wilson, *Chairman*	Slater, O.
	Dr. J. B. Murdock	Pittsburgh, Pa.
	Dr. G. L. Hoege	Fostoria, O.
	Dr. J. M. Dinnen, *Secretary*	Fort Wayne, Ind.
Chairman Committee of Arrangements,	Dr. W. J. Galbraith	Omaha, Neb.
	(With power to select four other members.)	
Committee on Transportation:	Dr. W. B. Outten, *Chairman*	St. Louis, Mo.
	Dr. W. J. Galbraith	Omaha, Neb.
	Dr. H. W. Morehouse	Danville, Ill.

Place of meeting, Omaha, Neb. Time to be decided on by executive committee.

On motion, a rising vote was taken on the election of Dr. Brock for president, which was unanimous.

It was then moved that the whole report be received and adopted. Carried.

On motion of Dr. Reed a committee of three was appointed by the chair to draft suitable resolutions pertaining to the meeting, which committee consisted of Drs. Outten, chairman, Cooper (of Atlanta) and Conn (of New Hampshire).

Dr. Reed also moved that a committee of three be appointed to lay out a programme for the next meeting. Carried.

The president appointed on this committee, Dr. N. Senn of Chicago, chairman, Dr. Thorn of Toledo and Dr. Ross of Richmond.

Dr. Outten moved that a committee of three be appointed to represent the hospital systems of railways in connection with the World's Fair, and to make an exposition of said systems. Carried.

The chair appointed on this committee, Dr. Outten of St. Louis, Mo., chairman, Dr. Elliott of Savannah, Ga., and Dr. J. B. Murdoch of Pittsburg, Pa.

Dr. Brock moved that everything following the words "per day" in by-law No. 1 be stricken out, as he thought the *Railway Age* could better take care of the matter, and thus save the committee of arrangements much work and expense to the association. Motion was carried by a two-thirds vote.

Dr. P. Dougherty, of Junction City, Kan., offered the following resolution, which was laid over for a year:

Resolved, That the transactions of this association shall be published hereafter in book form and distributed to the members and honorary members, and the treasurer shall pay for the same out of the treasury of the association, and that the papers shall be given to any reputable medical journal for publication which may desire to publish them without expense to the association.

The Executive Committee reported having examined the accounts and books of the treasurer and found the same correct.

Dr. N. Senn of Chicago then made some remarks on "An Experimental Study of Elastic Constriction as a Hæmostatic Agent," demonstrating elastic constriction on a patient. The subject was discussed by Drs. Lanphear, Northrop, Elliott, Marks, Thorn, Murdoch, Stemen, and discussion was closed by the author.

Dr. Nicholas Senn, chairman of the special committee on the programme for the sixth annual meeting of the National Association of Railway Surgeons, made the following preliminary report:

INJURIES OF THE SPINAL CORD AND ITS ENVELOPES WITHOUT FRACTURE OF THE SPINE.

1. History. By Dr. Geo. Ross, chief surgeon Richmond & Danville railroad, Richmond, Va.
2. Anatomical Landmarks. By Dr. Jabez N. Jackson, surgeon Wabash railroad, Kansas City, Mo.

3. Physiology of the Spinal Cord. By Dr. A. P. Grinnell, chief surgeon Central Vermont railroad, Burlington, Vt.

4. Experimental Research. By Dr. Thomas H. Manley, surgeon C. P. E. & W. R. R., New York, N. Y.

5. An Experimental Study of Spinal Myelitis and Meningitis. By Dr. George A. Baxter, division surgeon Chattanooga Southern railroad, Chattanooga, Tenn.

6. The Clinical Aspects of Spinal Localization. By Dr. Nicholas Senn, surgeon Chicago St. Paul & Kansas City railroad, Chicago, Ill.

7. Diagnosis from the Standpoint of the Neurologist. By Dr. C. H. Hughes, consulting surgeon Missouri Pacific railroad, St. Louis, Mo.

8. Pathology and Pathological Anatomy. By Dr. Samuel C. Benedict, surgeon Richmond & Danville railroad, Athens, Ga.

9. Prognosis. By Dr. Samuel S. Thorn, chief surgeon Toledo St. Louis & Kansas City railroad, Toledo, Ohio.

10. Treatment. By Dr. W. B. Outten, chief surgeon Missouri Pacific railroad, St. Louis, Mo.

11. Medico-Legal Aspects. By Judge J. H. Collins, chief counsel Baltimore & Ohio railroad west of the Ohio river, Columbus, Ohio.

12. Statistics of the Amount of Money Paid by the Railroads of the United States During the Last Ten Years for Alleged Injuries of the Spine. By Dr. F. K. Ainsworth, surgeon Southern Pacific railroad, Los Angeles, Cal.

13. Clinical Report—I. From a Medical Aspect: (*a*) Permanent Injuries, (*b*) Alleged Injuries; II. From a Legal Aspect: (*a*) Settled with Suit, (*b*) Settled Without Suit, (*c*) Miscellaneous. By Dr. Geo. Chaffee, surgeon Long Island railroad, Brooklyn, N. Y.

Secretary Lewis read a paper on "The Union Hospital Plan."

Dr. Outten made the following report as chairman of the committee on resolutions:

RESOLUTIONS OF THANKS.

WHEREAS, The Chesapeake & Ohio railway, through its generous and broad-minded general manager, Mr. George W. Stevens and his enthusiastic and practical chief surgeon, Dr. C. W. P. Brock, have contributed so largely to the scientific and social success of the fifth annual meeting of the National Association of Railway Surgeons by extending free transportation to its members, their wives, their daughters and their sons, and

WHEREAS, They have spared no means in entertaining their guests in the most royal manner; therefore be it

Resolved, That the National Association of Railway Surgeons express their heartiest thanks for this unusually generous and most effective manner in which the Chesapeake & Ohio Railway Company has contributed to the success of this association.

Resolved, That we conceive that this recognition of the National Association of Railway Surgeons, made in so prominent a manner, free from the faintest suggestion of reward, has rendered this association the most pronounced and well accorded recognition it has ever received.

Resolved, That this association not only hold the Chesapeake & Ohio Railway company in the highest esteem, but will credit it as being one of the essential factors which contributed to making this the largest surgical association on the American continent; and that in so doing, its action is pre eminently American-like and deserves especial thanks.

Resolved, That we cannot too highly praise its efficient general manager whose personal attention was given to the transportation of a very large majority of the members of this association in attendance at this meeting and without an accident to mar their pleasure.

Resolved, That an engrossed copy of these resolutions be framed and presented to Mr. George W. Stevens.

WHEREAS, The Cleveland Cincinnati Chicago & St. Louis railway company through its president. Mr. M. E. Ingalls, and its general manager, Mr. J. Ramsey, Jr., have so generously seconded the generosity extended the members of this association by the Chesapeake & Ohio railway company by lavishing free transportation on our members from all parts of the country, and thus very materially aided in the success of the present meeting, and

Whereas, Nearly a hundred other railway companies through their generous hearted and progressive officers have contributed largely to the phenomenal success of this meeting by extending free transportation to its members and their wives, and

Whereas, The Hygiea Hotel, together with other hotels at Fortress Monroe, Newport News, Hampton and Norfolk, all contributed to the comfort and happiness of our members and especially the Hygeia Hotel by furnishing free a spacious, convenient and comfortable hall for the meeting, therefore be it

Resolved, That the unqualified thanks and high appreciation of this association be extended to every railway company which contributed so largely to the success of this meeting, also to the hotel proprietors and managers for the courtesies entended by them.

The resolutions were adopted unanimously.

Dr. Oscar J. Price, Chicago, read a paper entitled "Aseptic and Antiseptic Methods in Railway Surgery."

Dr. Alexander J. Mullen, Jr., Michigan City, Ind., read a paper entitled "Local Anæsthesia." Discussed by Dr. Northrop.

Dr. Brock was then introduced as president of the association for 1893. In a few well chosen words he thanked the association for the honor that it had conferred upon him.

Dr. Samuel Birdsall, of Susquehanna, Pa., read a paper entitled "Caution in Regard to the Use of Bichloride of Mercury in Wounds."

Dr. Albert I. Bouffleur of Chicago followed with a paper on "Fracture and Dislocation of the Spine." Discussed by Dr. J. B. Murphy of Chicago.

Dr. Chas. W. Rook of Quincy, Ills., read a paper entitled "Treatment of Fractures Involving the Articular Surfaces of the Condyles of the Humerus."

The following papers were read by title and referred for publication:

1. "Surgical Treatment of Brain Injuries," by Dr. Chas. H. Merz, Sandusky, O.
2. "Color Blindness, Its Detection and Correction," by Jas. L. Minor, Memphis, Tenn.
3. "Report of Two Interesting Cases of Railway Injuries," by Dr. Webb J. Kelly, Galion, O.
4. "A Better Ambulance Service," by C. McV. Tobey, St. Paul, Minn.
5. "Railway Injuries, with Special Reference to Those of the Nervous System," by Dr. R. W. Bruce Smith, Seaforth, Ontario, Can.
6. "Shock in Railway Injuries, and the Fatality of Too Early Operation," by Dr. R. L. Payne, Jr., Lexington, N. C.
7. "Special Indications to be Considered in Determining Operations in Railway Injuries," by Dr. C. B. Parker, Cleveland, O.
8. "Double Synchronous Amputation," by Dr. Lester Keller, Beury, W. Va.
9. "Hypnotic Suggestion and Its Relation to the Traumatic Neuroses from the Standpoint of the Railway Surgeon," by Dr. J. H. Greene, Dubuque, Ia.
10. "Trephining," by E. M. Robinson, Bessemer, Mich.

11. "Railroad Dust in Railroaders' Noses," by Dr. W. H. Leod, St. Louis, Mo.

12. "A Record of 200 Amputations, with Deductions," by Dr. Wm. L. Estes, South Bethlehem, Pa.

13. "Chloroform or Ether," by Dr. D. W. C. Wade, Holly, Mich.

14. "Cranial Injuries, with a Case," by Dr. W. A. Ward, Conneaut, O.

15. "Diagnosis and Prognosis in the Regional Surgery of the Spinal Cord and its Coverings," by Dr. Thos. H. Manley, New York, N. Y.

16. "Trainman's Back," by Dr. J. N. Hall, Sterling, Colo.

17. "The Treatment of Fractures of the Elbow," by Dr. W. H. Buechner, Youngstown, O.

On motion, the association adjourned, to meet in Omaha, Neb., 1893, at a time to be fixed by the executive committee.

PRESIDENT'S ADDRESS.

Objects and Benefits of The National Association of Railway Surgeons.

[By Surgeon J. H. Murphy, St. Paul, Minn.]

Gentlemen: As I stand before you to-day, I realize that my prediction made five years ago is being rapidly verified. I prophesied at that time that in a few years the noble organization that I have the honor of addressing to-day would compare favorably in numbers, power and influence, with that grand old body, the American Medical Association.

How true that was must be seen by you all. Then I spoke to but a handful, to-day I speak to representatives from nearly every state and territory in the Union, the Dominion of Canada and the Republic of Mexico, and still we are as nothing in comparison to what we will be. As years roll on our members will increase and with numbers the power of doing good.

The railroads have begun to recognize us, no longer a pigmy, but a collossus whose mighty feet are planted, one upon the shores of the Pacific, the other upon the stormy coast of the Atlantic. The association demands in a voice of thunder that the world shall recognize its greatness.

This is an age of progress, of invention, of thought. And, gentlemen, we must think, we must invent; and progress will be the natural consequence. We must institute reforms in various directions; railway hospitals should be established on all instead of a few roads, and they should be thoroughly equipped with all the latest and necessary improvements. These hospitals could be stationed at proper distances and a hospital car used to transport the sick and injured to it.

All trainmen should be taught to arrest hemorrhage and to apply a thoroughly antiseptic dressing in case of injury. This in the examination of a man should be as important as the timecard or signals.

Only the other day a man had his leg crushed at the lower third by a locomotive on the Great Northern. He lay in the mud and dirt slowly bleeding to death, a crowd of railroad men around him, all willing enough to help him, but powerless through ignorance of the method. The man died while his life could have been saved had any one of the bystanders known of the "Spanish windlass."

Another matter that I feel that I must call your attention to is the deadly coupler. About 80 per cent of railroad injuries that I am called upon to attend are caused by coupling cars. This evil should be remedied, and as soon as possible. The only obstacle that prevents it to-day is the expense. This should be no obstacle at all. What is the expense compared with the unneccessary maiming or mutilating of thousands of men?

Every railroad should also be provided with emergency chests at regular intervals, filled with everything necessary to temporarily treat the injured during first attention and while en route to hospital. The system at present used by my worthy friend Dr. Galbraith, chief surgeon of the Union Pacific, is deserving of your earnest consideration. These are but a few of the many necessary and practical reforms we must institute. On some roads these things are done, but on how many more are they not done. I feel that we have a great mission to perform, one that will result in the saving of innumerable lives and immense sums of money. To accomplish these results we must work together, we must each and every one of us toil unceasingly for the accomplishment of our object. Don't let a few men do all the work; every little helps you know. Yonder ocean is made up of atoms; innumerable atoms constitute a drop and untold drops the ocean. These drops move together and the tide rolls in and out; on its mighty bosom is carried the commerce of the world; on it has been decided the fate of nations. Truly we may say as we gaze upon it, unity is strength. So let it be with us; let each one add a drop; let us move together; let no petty squabbles interfere with us; let us look forward to a Utopia; let us make our aim as high as possible, even though we fall short of the mark.

We meet once a year to discuss our cases, our methods of doing work and our results. In no other body of men in the world could we find so many of vast experience in accidental surgery; it is a branch of medicine by itself, a branch not sufficiently emphasized in our colleges. There can be but few rules laid down in regard to the treatment of railroad injuries, the injuries are of such variety. Only by experience can one master the subject. I have practiced surgery almost exclusively for forty odd years and have seen a vast variety of cases, yet every year at our meetings I learn something new, hear of some rare accident, of its treatment and the result. To me they are very beneficial; to a young man they must be incalculably so.

Let us attend the meetings; let us listen with rapt attention, and when we have separated and each gone to his duty treasure in our memories the new truths we have learned, and at the first opportunity use them.

These yearly harvests of ideas serve to keep us out of old ruts, the bane of our profession. Above all, don't get into a rut; it grows deeper and deeper as you travel it, until at last when you endeavor to look out, alas, what do you see? Nothing. To your egotistical and biased eyes you are perfect; others fools. Alas, my friends, some day the scales will fall from your eyes and Robert Burns' wish will be gratified, you will see yourselves as others see you, then where will the fools be? Answer it yourselves.

Gentlemen, have you ever sat down and calmly thought what our association is? Well, I will tell you. The American nation to-day is recognized by all foreign countries as the most enterprising, most progressive on the globe. Let us glance for a moment at a map of this United States. What do we see? Miles upon miles of railroad, over the mountains, through the mountains, penetrating to every nook and cranny of our country. These roads employ more than three-quarters of a million of men, and we must look after them. We have met here to-day to consider how this can best be done. We are told of various methods, each of which has stood the test of time; we are privileged to choose from among them.

The eyes of the medical profession of the world are upon us; let us merit their approbation. We are only another upstart from the ingenious American brain, but let us tenderly nurture the sprout which has sprung from the little seed planted by Dr. Ridenour of Massillon, Ohio, in 1887, until it shall have become a mighty tree, a monarch of the forest; until its cooling shade shall be as balm to the wounds of the injured of America; until its influence can be felt from the Atlantic to the Pacific and from the rockbound coast of Maine to the everglades of Florida. Then and only then may we rest. This grand result depends not upon you nor upon me, but upon all of us. Each and every one must contribute his mite, each and every one must do his duty, and when at last the battle is over we may rest assured of the "well done, good and faithful servant."

Do not look upon this as chimerical. I assure you it is not. I have seen the American Medical association grow to its present proportions, why then should we not increase? So, to use the western phrase, let us all rustle, and build a monument for ourselves, not of stone nor of brick, but of brains. In doing this we will raise the railroad surgeon to his proper level. Protected by the association he will be an honor to himself and the road which employs him.

◆

CHAPTER II.

SURGICAL SERVICE.

The History of Railway Surgical Organizations.

[By Surgeon C. B. Stemen, Fort Wayne, Ind.]

During the early part of the winter of 1881, Dr. J. T. Woods of Toledo, Ohio, who was then chief surgeon of the Wabash railway east of the Mississippi, made a visit to the the city of Fort Wayne, Indiana, and at that time it was decided to call a meeting of the surgeons for the purpose of considering the propriety of organizing a railway surgical association. The call was made to meet at Decatur, Ill., on the 25th of January, 1892. At the time named a large number of surgeons assembled and after hearing two able papers read by the chief surgeon, an organization was perfected by electing Dr. J. T. Woods president and the writer secretary and treasurer. The following surgeons were present at the meeting:

Dr. J. T. Woods, Toledo, Ohio, chief surgeon; Dr. J. S. Gregg, Fort Wayne, Ind.; Dr. C. B. Stemen, Fort Wayne, Ind.; Dr. W. H. Bell, Logansport, Ind.; Dr. J. C. Hearne, Hannibal, Mo.; Dr. A. L. Elder, Fisher, Ill.; Dr. C. V. Rockwell, Taylorville, Ill.; Dr. John C. Walker, Indianapolis, Ind.; Dr. R. W. McMahan, Quincy, Ill.; Dr. A. D. Coe, Mexico, Ind.; Dr. P. H. Barton, Danville, Ill.; Dr. F. W. Beard, Vincennes, Ind.; Dr. A. H. Shaffer, Huntington, Ind.; Dr. George F. Beasley, Lafayette, Ind.; Dr. W. B. Graham, Noblesville, Ind.; Dr. T. B. Campbell, West Lebanon, Ind.; Dr. Alex. J. Mullen, Jr., Michigan City, Ind.; Dr. W. J. Chenoweth and Dr. Cass Chenoweth, Decatur, Ill.; Dr. D. J. Swarts, Butler, Ind.; Dr. William Scott, Kokomo, Ind.; Dr. G. W. Parker, Cairo, Ill.; Dr. A. U. Williams, Sullivan, Ill.; Dr. A. T. Darrah, Tolono, Ill.; Dr. N. N. Vance, Bement, Ill.

It was voted that the organization should be known as the surgical society of the W. St. L. & P. railway east of the Mississippi river. It was ordered that the papers read by Dr. Woods, together with the proceedings, be published in the Fort Wayne Journal of Medical Sciences. This was the first railway surgical association ever organized, and it is with great satisfaction and some degree of pride that we can state that this organization has had annual meetings up to the present time; in fact the last meeting held in the city of Fort Wayne, Ind., last November was one of the best ever held and for ten years it has been doing much for the advancement of accidental surgery and for organized systematic work on the hospital plan. We also take pleasure in stating that from the very first up to the present the surgeons have had the earnest support of the officers of the company, all co-operating in carrying forward and developing a plan of taking care of the injured and sick employes, which we believe will be adopted by many of the railways of this country, for certainly the years that this plan has been in successful operation have clearly demonstrated that it is not only a good one, but the best that can be adopted. There are many railways operating the hospital plan, but which do not have a regular surgical association. In our meetings we frequently have been honored by the presence of the superintendents, both division and general, and also by the general manager, Charles M. Hays, Esq., who has always manifested a very great interest in the success of the surgical association of his road.

Some time in September of the same year, 1882, Mr. C. D. Law, superintendent of the western division of the Pennsylvania lines, known as the Pittsburgh Fort Wayne & Chicago railway, appointed the writer to meet with Dr. J. G. Buchanan of Pittsburgh, who had been appointed by Mr. A. B. Starr, the superintendent of the eastern division of the same road, for the purpose of arranging for a meeting of the surgeons of the Pennsylvania company. We met and arranged to call a meeting in Crestline, Ohio, Oct. 18, 1882. The surgeons were informed of the proposed meeting, a number assembled and an organization was perfected by electing the writer president, Dr. J. G. Buchanan vice-president, and Dr. P. B. Young secretary. The following surgeons were present: Drs. A. I. Scott, Beer, Reynolds, T. Davenport, W. H. Myers, B. S. Woodworth, C. B. Stemen, G. W. McGavern, R. W. Thrift, M. C. Cuykendall, P. B. Young, B. McConnell, Johnson, D. McKinney, Firestone, J. H. Tressell and J. G. Buchanan. This was the second railway surgical association organized in this country, and it is also with great pleasure that we note that it held regular semi-annual meetings up to 1888, when the national association was organized, and ever since then has held annual meetings, and has also accomplished much in developing the great results of organized railway surgery.

In May, 1887, at the meeting of the Pennsylvania company surgeons it was proposed to call a meeting for the purpose of forming a national association of railway surgeons, but no definite action was taken. But at the meeting of the same year in Pittsburgh Dr. A. W. Ridenour of Massillon, Ohio (now deceased), offered the following resolution, which was adopted:

Resolved, That it is the best interest of the various railroad surgeons' associations, of the companies they represent and of railroad sanitation that a national meeting of railway surgeons, representing as many roads as may be induced to respond, be held; that this association take initiatory steps by sending out invitations to the various railway surgeons' associations—to chief surgeons where no association exists, to individual surgeons where no chief exists—to meet at Pittsburgh, St. Louis, Chicago, Philadelphia or New York in June, 1888, there and then to perfect an organization to be known as the American Association of Railway Surgeons.

The president, Dr. Firestone, appointed as a committee to act upon this resolution Dr. C. B. Stemen, chairman, Dr. J. G. Buchanan, secretary, Dr. S. S. Thorn, Dr. J. H. Tressell and Dr. A. W. Ridenour. This, then, was the initiatory of this great surgical association. As will be seen the organization originated in the east, in the city of Pittsburgh, where the first committee was appointed, and the surgical association of the Pennsylvania company has the honor of making the first move; so that the honors between the Wabash and the Pennsylvania company are about equal, the Wabash the first to organize, the Pennsylvania second, the latter the first to propose the calling of a meeting for the purpose of organizing the national association, and the Wabash the second to appoint a committee to co-operate in calling the meeting, as will be seen by the following action taken at the meeting at St. Louis, Dec. 21, 1887: "The propositions from the surgeons of the Pennsylvania company in regard to holding a national meeting of railway surgeons was presented, and Drs. C. B. Stemen, J. W. Jackson and C. B. Higgins were appointed a committee to confer with the surgeons of the

CHAPTER II.

SURGICAL SERVICE.

The History of Railway Surgical Organizations.

[By Surgeon C. B. Stemen, Fort Wayne, Ind.]

During the early part of the winter of 1881, Dr. J. T. Woods of Toledo, Ohio, who was then chief surgeon of the Wabash railway east of the Mississippi, made a visit to the the city of Fort Wayne, Indiana, and at that time it was decided to call a meeting of the surgeons for the purpose of considering the propriety of organizing a railway surgical association. The call was made to meet at Decatur, Ill., on the 25th of January, 1892. At the time named a large number of surgeons assembled and after hearing two able papers read by the chief surgeon, an organization was perfected by electing Dr. J. T. Woods president and the writer secretary and treasurer. The following surgeons were present at the meeting:

Dr. J. T. Woods, Toledo, Ohio, chief surgeon; Dr. J. S. Gregg, Fort Wayne, Ind.; Dr. C. B. Stemen, Fort Wayne, Ind.; Dr. W. H. Bell, Logansport, Ind.; Dr. J. C. Hearne, Hannibal, Mo.; Dr. A. L. Elder, Fisher, Ill.; Dr. C. V. Rockwell, Taylorville, Ill.; Dr. John C. Walker, Indianapolis, Ind.; Dr. R. W. McMahan, Quincy, Ill.; Dr. A. D. Coe, Mexico, Ind.; Dr. P. H. Barton, Danville, Ill.; Dr. F. W. Beard, Vincennes, Ind.; Dr. A. H. Shaffer, Huntington, Ind.; Dr. George F. Beasley, Lafayette, Ind.; Dr. W. B. Graham, Noblesville, Ind.; Dr. T. B. Campbell, West Lebanon, Ind.; Dr. Alex. J. Mullen, Jr., Michigan City, Ind.; Dr. W. J. Chenoweth and Dr. Cass Chenoweth, Decatur, Ill.; Dr. D. J. Swarts, Butler, Ind.; Dr. William Scott, Kokomo, Ind.; Dr. G. W. Parker, Cairo, Ill.; Dr. A. U. Williams, Sullivan, Ill.; Dr. A. T. Darrah, Tolono, Ill.; Dr. N. N. Vance, Bement, Ill.

It was voted that the organization should be known as the surgical society of the W. St. L. & P. railway east of the Mississippi river. It was ordered that the papers read by Dr. Woods, together with the proceedings, be published in the Fort Wayne Journal of Medical Sciences. This was the first railway surgical association ever organized, and it is with great satisfaction and some degree of pride that we can state that this organization has had annual meetings up to the present time; in fact the last meeting held in the city of Fort Wayne, Ind., last November was one of the best ever held and for ten years it has been doing much for the advancement of accidental surgery and for organized systematic work on the hospital plan. We also take pleasure in stating that from the very first up to the present the surgeons have had the earnest support of the officers of the company, all co-operating in carrying forward and developing a plan of taking care of the injured and sick employes, which we believe will be adopted by many of the railways of this country, for certainly the years that this plan has been in successful operation have clearly demonstrated that it is not only a good one, but the best that can be adopted. There are many railways operating the hospital plan, but which do not have a regular surgical association. In our meetings we frequently have been honored by the presence of the superintendents, both division and general, and also by the general manager, Charles M. Hays, Esq., who has always manifested a very great interest in the success of the surgical association of his road.

Some time in September of the same year, 1882, Mr. C. D. Law, superintendent of the western division of the Pennsylvania lines, known as the Pittsburgh Fort Wayne & Chicago railway, appointed the writer to meet with Dr. J. G. Buchanan of Pittsburgh, who had been appointed by Mr. A. B. Starr, the superintendent of the eastern division of the same road, for the purpose of arranging for a meeting of the surgeons of the Pennsylvania company. We met and arranged to call a meeting in Crestline, Ohio, Oct. 18, 1882. The surgeons were informed of the proposed meeting, a number assembled and an organization was perfected by electing the writer president, Dr. J. G. Buchanan vice-president, and Dr. P. B. Young secretary. The following surgeons were present: Drs. A. I. Scott, Beer, Reynolds, T. Davenport, W. H. Myers, B. S. Woodworth, C. B. Stemen, G. W. McGavern, R. W. Thrift, M. C. Cuykendall, P. B. Young, B. McConnell, Johnson, D. McKinney, Firestone, J. H. Tressell and J. G. Buchanan. This was the second railway surgical association organized in this country, and it is also with great pleasure that we note that it held regular semi-annual meetings up to 1888, when the national association was organized, and ever since then has held annual meetings, and has also accomplished much in developing the great results of organized railway surgery.

In May, 1887, at the meeting of the Pennsylvania company surgeons it was proposed to call a meeting for the purpose of forming a national association of railway surgeons, but no definite action was taken. But at the meeting of the same year in Pittsburgh Dr. A. W. Ridenour of Massillon, Ohio (now deceased), offered the following resolution, which was adopted:

> *Resolved*, That it is the best interest of the various railroad surgeons' associations, of the companies they represent and of railroad sanitation that a national meeting of railway surgeons, representing as many roads as may be induced to respond, be held; that this association take initiatory steps by sending out invitations to the various railway surgeons' associations—to chief surgeons where no association exists, to individual surgeons where no chief exists—to meet at Pittsburgh, St. Louis, Chicago, Philadelphia or New York in June, 1888, there and then to perfect an organization to be known as the American Association of Railway Surgeons.

The president, Dr. Firestone, appointed as a committee to act upon this resolution Dr. C. B. Stemen, chairman, Dr. J. G. Buchanan, secretary, Dr. S. S. Thorn, Dr. J. H. Tressell and Dr. A. W. Ridenour. This, then, was the initiatory of this great surgical association. As will be seen the organization originated in the east, in the city of Pittsburgh, where the first committee was appointed, and the surgical association of the Pennsylvania company has the honor of making the first move; so that the honors between the Wabash and the Pennsylvania company are about equal, the Wabash the first to organize, the Pennsylvania second, the latter the first to propose the calling of a meeting for the purpose of organizing the national association, and the Wabash the second to appoint a committee to co-operate in calling the meeting, as will be seen by the following action taken at the meeting at St. Louis, Dec. 21, 1887: "The propositions from the surgeons of the Pennsylvania company in regard to holding a national meeting of railway surgeons was presented, and Drs. C. B. Stemen, J. W. Jackson and C. B. Higgins were appointed a committee to confer with the surgeons of the

Pennsylvania company." I should have said that the surgical association of the Chicago & Atlantic also appointed a committee to assist in the calling of the meeting for the purpose of organizing the national association. Since then many others followed.

The committee sent out the following circular to general managers:

> Sir:—The enclosed circulars are to be sent to the surgeons of your road. Will you be kind enough to have them sent to all the local surgeons on your line? The National Association of Railway Surgeons will, we trust, do much to advance the interests of railway surgery in this country, and we desire your co-operation in this movement of organizing such an association of the surgeons whose duty it is to take care of the injured employes and passengers. Will you arrange for transportation for all who may desire to attend the meeting at Chicago? We very much desire that your company shall be represented at this meeting.
>
> Yours truly, C. B. STEMEN,
> J. H. TRESSELL, M. D.
> R. L. SWEENY, M. D.

The committee gave the chairman unlimited power to send out circulars and invitations to railway officials and chief surgeons, to meet in Chicago June 28, 1888. We received very many letters, some of a discouraging nature, but others full of encouragement. Especially do I desire to say that from 600 letters sent to railway officials stating the object of their meeting and asking their co-operation and free transportation for the surgeons there was but one unfavorable reply, and that came from Boston. I am very sorry that I cannot find this letter. Its writer was the only one among all the railway officials of this great country who refused or in any way answered me discourteously. Consequently we felt greatly encouraged for the reason that it was not for self-aggrandizement or for any special benefit that might come to the members of this committee that the very arduous task was undertaken, but from the painful fact that the practice of accidental surgery, especially that of railway surgery, involving injuries produced by heavy machinery, was not as fully understood by the great army of railway surgeons as it should be, and conviction that if the surgeons throughout this great land of ours should meet and discuss the various and serious accidents that are so frequently met with great good would result, not only to the unfortunate injured, but also to the railway companies. Hence the work was undertaken.

One incident will explain how sanguine even the committee was in reference to the attendance at this meeting. The arrangements had been made to hold the meeting in parlor O of the Palmer house, which would probably have seated not more than 40 persons, but we found more than 200 present at this meeting. Dr. J. W. Jackson, the then chief surgeon, was elected its first president, Dr. C. B. Stemen the secretary, and Dr. R. Harvey Reed treasurer. The total number who registered and paid their fee at the first meeting was 189. Next year there were received 270 additional members, and in 1890 there were added 179, making in all 638 members. This was the number up to the time of the meeting at Buffalo, New York, last May. Since then there has been quite an increase in the membership.

When we look back to the time of the first organization in January, 1882, and remember the opposition of some of the members of the profession we are surprised at the wonderful success that has been attained by the friends of the railway surgical associations. The object of these organizations is to better qualify the surgeons for their responsible work, and to interchange thoughts and to relate our experience in the management of the many cases we are called upon to treat. It is not for the increase in wages and for less hours of labor, but to prepare ourselves to do good and relieve the unfortunate injured. This we must frequently do without assistance, and upon our prompt action will depend the life or lives of many injured. We have no time then to consult our text books, no time to call our professors of surgery or even a consulting physician, but we must act at once and upon our good judgment and prompt decision depends, it may be, the life of the unfortunate. How important then that we have these organizations where we can meet and instruct each other in our very important and responsible work. Who has ever attended any of these meetings who has not gone to his home and to his work as a railway surgeon feeling that he was better prepared for the responsibilities of his position? It is the experience of many that even from those who disagree with us and who have not had the same amount of experience that we have had, we have gained some practical points in the discussion of the different subjects and methods of treatment at the meetings.

Have you not been called some cold night to go to a fearful wreck? You responded promptly and on arriving you have heard the groans of the injured and the dying. How important then that you have full confidence in your ability to relieve the unfortunate; how important that the surgeon under such circumstance be cool, "level headed" and ready to go to work in a proper manner to relieve the injured and attend their wounds. But unless he has had some special training for this special work he will not be able to do this as it should be done. The special training is just such as he can get by attending these meetings and being attentive to the papers read and the discussions on the various subjects of railway surgery, which is the surgery of the country at the present time. Of course we have some who are giving all their attention to "abdominal surgery," but this is not to be compared with the accidental surgery of the railway surgeons. In the former while the patient is being prepared the surgeon is also preparing himself, but in railway surgery there is no time for preparation, but prompt and decisive action is required. The railway companies and the employes are greatly indebted to these railway organizations for the high standard of the surgical service, and we firmly believe that through these organizations much good will yet come to the railway employes and traveling public. Already the sanitary arrangements of our railway coaches are being considered and we believe will be greatly improved, and many precautions are now taken to avoid accidents, and many preparations are made for the speedy and prompt treatment of those who may be injured. In all of these organizations it is of the greatest importance that we act in complete harmony with the officers of our railways and secure their hearty co-operation and support.

I have a few suggestions to make before closing this paper. Having been connected with and taken an active part in the organization of surgical associations, and having been the first surgeon to undertake to publish a journal in the interest of this specialty, and in this way having given a great deal of thought to this department of surgery, I have thought it not improper to say that I believe that the surgical service of every railway company should be thoroughly organized by the appointment of a chief surgeon for the entire system, and also division chief surgeon. They should give their entire time to the work of their division by looking after the injured and directing the work of the local surgeons who should be employed to look after the injured at their stations, and when an accident occurs to at once notify the chief surgeon of the division, give such temporary or permanent relief as the nature of the case may demand, and prepare the patient so that he can be safely transported to his home or hospital. The chief surgeon should make arrangements to receive the patient and see that he is properly treated. The local surgeon should at once make out a report of the nature of the injury, how it occurred and the treatment employed, so that a complete record could be kept at the office of the chief surgeon of every case of injury. This is an important matter, not as some suppose for the purpose of preventing persons from receiving compensation for personal injury, but in order that the treatment may be more intelligently and properly carried out. To a body of surgeons such as are before me the importance of this fact need not be argued. What is required on all the railways is a thoroughly organized surgical and medical service. In traveling through Europe a few years ago, for the purpose of investigating the methods employed by foreign railway companies in taking care of their sick and injured employes as well as injured passengers, I found that all the leading railway companies had a medical and surgical organization with chief and local surgeons, and this was so arranged that the employes were organized with a provident society which entitled them to weekly benefits when sick or injured. Of course each member paid a certain assessment, which was deducted from his wages. I believe that the assessment plan, what is known as the "hospital plan" or something of that nature, is the best plan to be adopted. Again, there should be a medical examination made of every person desiring to enter the service of the railway company. Most of the suits brought into our courts for damages for personal injury are the result of disease and not of injury. The so-called "spinal disease concussion" is frequently the result of some constitutional disease (perhaps syphilis) and not of injury, which could have been detected had a careful examination been made before he entered the service. This I believe is an important matter, and railway officials will no doubt adopt the suggestion when properly brought to their notice. We have much of importance to do and it will only be brought about through these railway surgical associations. Let us then continue to labor earnestly in this direction. Much has been accomplished and there is much more to be done.

DISCUSSION.

Dr. E. Griswold, Sharon, Pa.—Dr. Stemen touches one of the key notes in the conclusion of his paper when he says applicants for positions as railroad surgeons ought to be examined, and he would have touched another if he had said that they should be properly paid for their services. I am sorry he did not say that every man employed as a railroad surgeon should be examined as to his fitness before appointed. I think if that were the case there would be less trouble with regard to suits for damages, and surgeons would better understand their duties.

Dr. W. B. Outten, St. Louis, Mo.—I desire to say a few words regarding the paper that has just been read and to express a feeling which I have as regards the writer of the paper. He has been a pioneer in this business.

He is an honest, conscientious, good worker, and has accomplished a world of good for this association. Now then, from the purely utilitarian standpoint of one who occupies a position and who has seen the absolute necessity of organization, I desire to speak, particularly as regards this paper. The doctor suggested that it would be a good idea to have surgeons who work for railroad companies pass an examination. That is all very well as far as it goes. We want good material, but it takes a good man who will sacrifice his education and go out in the region of country where the Missouri Pacific and other roads run. I will say this: that we find certain men in that community who have not been thoroughly educated and yet, by the intellect they possess, are able to fill their positions ably and well.

As regards this examination, there was a time when I thought all employes ought to be examined as far as color-blindness is concerned, so that perfection itself might come; but the older I get the more humane and charitable I have become as regards this matter. I believe after all the whole basis upon which we rely with any class or character of men is good common sense. I can point to man after man who would be incompetent to give correct color, yet by some unknown means with which nature has endowed him he is competent to avoid a red light above all. Very few are competent to judge of the fine gradations of color. Many a man has been thrown out of his position as engineer because some scientific gentleman has made a mistake in the matter of color-blindness, but when we take into consideration the application of every point we find that it requires little more than good common sense on the part of the engineer.

Again, in regard to the formation of this organization I desire to compliment Dr. Stemen for what he has done. He is the father of this movement. [Applause.]

The Organization of a Railway Surgical Department.

[By Surgeon W. H. Elliott, Chief Surgeon Central Railroad of Georgia, Savannah, Ga.]

In presenting this subject for your consideration I have to say that I do not expect to enlighten those who have already finished the work of organization on their own roads. I merely wish to put upon record such a statement of the problems involved and their solution as would have been of the greatest assistance to me in the position in which I was placed.

I had long been a surgeon, but had had a very brief experience in railroad work when I was suddenly called on to organize the surgical department for the Central of Georgia, a railway system of nearly 2,000 miles. I had before me the blank forms and circulars of several of the leading systems of this country. These possessed merit of the highest order and I made free use of them; but none of them seemed to meet my wants exactly, and I felt that the entire adoption of the plans of others would fail to give me that control of my department that would come from the working out for myself the problems before me.

I shall ask your attention not so much to forms and rules as to the principles that underlie them. I trust that the subject will interest not only the prospective heads, but the members also of the surgical staff. Each member thereof will perform his duties more intelligently and with greater interest in his work if he feels that he is part of a system, the whole of which will work well just in proportion as the component parts act in harmony with each other. It behooves each member of the staff to understand the rationale of the system to which he belongs and to contribute his part to its successful operation.

THE STAFF.

In the work of organizing a surgical department the selections of the corps of surgeons will naturally claim attention first. This matter can be more quickly and satisfactorily done in person than by correspondence. It is very difficult to obtain by letter a man's real opinion of the qualifications of another. People hesitate to place on record their opinions of their fellow citizens, and it may be taken for granted that the average man will recommend his own friend or physician. It is desirable that the chief should at least *see* each man that he proposes to appoint. If he does this he will possibly save himself many a disagreeable task and much heart burning in others.

But if he cannot spare the time for a personal inspection of the field then inquiries must be made by letter. The form that has been found most apt to elicit the truth is a series of questions like these:

Whom do you consider the best surgeon in your locality?

Whom the next best?

Who does the largest practice and has had the most surgical experience?

State the age, date of graduation, and college, personal and professional standing of the man you recommend. Has he the courage to maintain his opinion in court?

Inquiries are best directed to the railway agent, to any physician of good standing who, you may know, does not desire the position for himself or a relative, and to any person in whose judgment you confide. It is well to make no appointment upon the unsupported recommendation of any one person. Scrutinize closely the letters you receive. If there is any personal or interested motive it can generally be read between the lines.

In selecting the staff it is well to take your time. "Festina lente" is a good motto here. It is a satisfaction to feel that you have secured the best men along the line of the road; and when you have found out that you have a second rate man this does not dispose of him. You feel that in justice to the individual you must wait till he makes a mistake before you are warranted in dismissing him. Do not, then, spare time and pains in selecting the staff. No thoroughness of organization nor strictness of discipline will secure good service if the staff is poor.

I have found what I call a "book of remembrance" a great aid in keeping the personal record of the members of the staff. I there jot down the character of the reports and accounts received and any material facts affecting the standing of the surgeons.

THE CONTRACT.

Having decided upon the personnel of the staff the contract will come next in order. This must specify clearly the duties of the surgeon and his compensation therefor. In fixing the terms you will possibly be restricted to some extent by the railway authorities. However this may be it is to be remembered that corporatious offer several other inducements besides the rates in the fee-bill. These are regular appointment, prompt and certain payment and an annual pass. Such weight have these additions to the fee-bill that some railways have succeeded in obtaining the services of surgeons for the annual pass alone. But in such cases the services required are temporary only, it being the policy on these roads to have all cases sent to hospital as soon as possible. Still, whatever the conditions, the practice is not one to be commended as promoting either the interests of the roads or the self-respect of the surgeon. Most of the larger railway systems of this country, whether run on the hospital plan or not, have a fee-bill as a part of the contract. The rates are generally about one-half those which obtain in our cities. In fixing the scale of charges it is fairer to both parties to allow so much for the first visit in each specified case, with a regular tariff for all subsequent visits. A fixed charge for the case only would make the compensation too high, perhaps, in cases fatally brief, and too low in the longer cases which terminate in recovery. The plan recommended prevents inequalities and is just in all cases to the road and the surgeon.

The duties of the surgeon should be to attend all injured parties to whom he is summoned by the duly authorized officers of the company, to obey all lawful instructions of the chief surgeon, to keep and render reports of all cases and to give expert testimony in court. He must look to the company only for his compensation and must agree to furnish a competent substitute whenever his services are not available. The surgeon may or may not be required to furnish medicines and appliances for the injured, but it simplifies accounts and saves much correspondence for him to do so, and the charges in the fee-bill can be regulated to cover the outlay. While in severe cases this may prove inadequate, in the long run it is fair. It is usual to add that in cases of more than one injury to one person only the most serious will be charged for, and in visiting more than one patient at a distance mileage will be allowed on one account only. In cases requiring unusual attention or long distances and for all services not specified in the contract the chief surgeon will fix the compensation. For minor specifications I refer to the contract itself, a copy of which is appended to this paper.

DIRECTIONS FOR EMPLOYES.

We will next consider the medical directions for employes in cases of accident, which should include the rules for the employment of surgeons and the proper disposition of the injured. As these are for the direction and guidance of employes generally, copies should be framed and posted in baggage cars, freight trains, shops and in all such places that they will be readily found in cases of accident.

Medical directions to the laity cannot be too plain and brief. By many surgeons they are thought to be useless. At least they can do no harm, and if not followed the responsibility will not lie with the surgeon.

When an accident occurs the ranking official of the company present should assume charge and direct the operation for the relief of the sufferers. Injured persons should be kept in the recumbent position, and a broken limb placed and retained in the position most comfortable to the patient. Till the arrival of the surgeon opiates should be administered to relieve pain, hemorrhage should be controlled by pressure, and in cases of severe shock stimulants cautiously given in small doses.

Where the injured person is able to be moved, take or send him to the nearest surgeon of the company *in the direction the first train is going.* It can then be decided whether the patient will be treated there or taken to some other point. When the injured person is not able to be moved place him in charge of the station agent, section master, or some official of the company and summon the surgeon of the company most easily obtained.

In urgent cases if no surgeon of the company can be promptly had, summon the nearest physician to render assistance till the surgeon arrives.

In a general emergency, summon the surgeons of the company in both directions, and notify the authorities if more surgeons are needed. State the number of persons injured and the character of the injuries as clearly as time will allow, that the surgeons may know what is needed.

Next in importance to the care of the injured is the matter of

SURGEONS' REPORTS OF CASES.

As these reports are mainly for the use of the law and claim departments, the company's counsel will be consulted in regard to their matter and form. The requirements of these departments were best met by two blank forms for surgeons' initial and final reports.

The "initial report" must be made out by the surgeon as soon as practicable after he has made his diagnosis and promptly forwarded to the chief surgeon. This report should give such particulars as the name, age, color, sex, residence, occupation of the patient, the date and place of the accident, the patient's statement of the manner of injury, a clear and definite opinion as to the nature and extent of the injuries and the condition of the patient when first seen. His general health and past history must be inquired into, especially whether there was any previous injury or disability. To aid the surgeon in accurately defining lesions, new or old, sets of Keen's anatomical diagrams are printed on the back of the reports. By the use of red ink the location, direction and extent of the injuries can be distinctly shown. The surgeon must give his opinion in regard to the probable duration and result of treatment, in order that the claim adjuster may have a basis for early settlement should he desire to make one. Lastly, the report must state where the patient is placed for treatment and his present address. To the initial report must be attached the summons which the surgeon has received to attend the case. Failure to do this will render the bill for services in the case liable to rejection.

It is the custom in the surgical departments of some railways to require monthly or weekly reports of all cases under treatment. These will be found necessary on the large systems where a considerable number of cases are in charge of one surgeon; but otherwise current reports of important or unusual cases may be called for when wanted.

When the case has terminated the surgeon will make out the "final report."

This will begin with the name, the date of the injury and the number of the case for convenience of identification. There will follow a brief history of operations performed, and of any pertinent or interesting facts during the progress of the case. The surgeon will say whether or not wounds have been treated antiseptically. Of chief importance will be the statement of the results of treatment. The surgeon must record precisely any deformity, loss of tissue, and define exactly the character and duration of the resulting disability. He must say definitely whether or not this is permanent, and to what extent it impairs the earning power of the patient.

Lastly is recorded the final disposal of the patient; that is, the date of return to duty and the name of the official to whom he is ordered to report, or his address in case another disposition is made of him. In the order of discharge from treatment it is well to state what disposition the patient has shown to carry out instructions. This may have an important bearing on his pay while disabled, his further employment by the company, or on his claim for damages before a jury. With the final report must be sent the surgeon's bill for services in the case. This must give the date of each visit and specify the character of the service rendered. The chief surgeon will thus, when he examines the account, have before him all the records bearing on the case.

A record of the amount and date of approval of each bill that is passed is made on the surgeon's report, and also in the indexed book in which the expenses of the department are kept.

In the system which I have the honor to serve the reports of cases are printed and written in copying ink and copies are furnished to the law department upon demand. The original reports with all papers relating thereto attached are numbered in the order of reception, and filed for future reference.

Lastly will come the

INSTRUCTIONS TO SURGEONS.

These will first define the duties of the surgeon to the railway and surgical department. As a rule surgeons have no power to bind the company by promises or to settle claims, but they are expected to use their influence in every honorable way to prevent suits against the company, and they will give any assistance in their power to the claim and law departments whenever called upon.

In cases of emergency, when an outside surgeon has been called in, the surgeon of the company is expected to guard its interests. He should on arrival notify the physician that the company will be responsible only for services already rendered, and with consent of the patient should assume charge of the case. He must ascertain and record in his report the history of the case, including all facts necessary to a proper adjustment of the physician's account, such as the character and duration of service, the number of visits made and the distance traveled. He will obtain from the physician his bill for services rendered and endorse upon it his approval or disapproval. He will endeavor to have the physician conform to the fee-bill of the company, and failing in this, will note if the charges exceed the legal rate.

When a patient is transferred from the care of one surgeon to another a copy of the "initial report" with history of the case brought up to the date of transfer, with the reason therefor noted thereon, must be sent with the patient or mailed to the surgeon who is to receive the case. Both surgeons will notify the chief surgeon of the transfer.

THE PROFESSIONAL INSTRUCTIONS

to surgeon will vary much with the views of the writer and the needs of the service. What these are the chief surgeon will learn from the character of the reports and the results of treatment. He will judge too of the opportunities the members of the staff have had for learning and practicing modern methods in surgery. The day for the discussion of the merits of cleanliness and antisepsis has passed, and those who do not fully accept these essential principles of their art had better be dropped from the roll. In deciding for myself what instructions to issue to surgeons I have drawn up a brief list of the articles that surgeons are expected to keep on hand in order to be prepared for emergencies and the antiseptic treatment of wounds. The attention of the staff has been called to the importance of the free use ot anodynes, especially opiates, in the treatment of injuries. I am satisfied from long study and experience that the more promptly and thoroughly pain and shock are relieved by anodynes the more quickly the injured will recover. *Humanity and sound treatment both call for the free exhibition of opiates to the injured,* especially those who must be transported long distances. All danger of narcotism will be guarded against by the caution that no patient must ever be awakened for the administration of a dose.

A few other cautions have been added. Surgeons are advised to defer capital operations till reaction has set in. While this is a mooted point I confess I cannot see the rationale of adding the shock of an operation to that of the injury.

I think it is an error to apply directly to the skin bandages, adhesive plasters or anything that entirely encircles a limb. Bandages should be used only to retain splints or other appliances in place. All dressings should be put up so as to allow for subsequent swelling. The plaster of paris bandage which encircles the whole limb is dangerous unless cut open from one end to the other. The plaster splint which is made open its whole length will yield to the swelling and can be applied to recent fractures with perfect safety. In shipping serious cases of fracture the plaster splint is far superior to any other dressing, and we are now enabled to ship without risk cases that under the older methods must have been treated in situ.

It is advisable that the surgeons of each railway system should organize themselves into an association and hold meetings at least once a year for mutual benefit and improvement. This proposition does not need argument before this body. At our meetings I went to school and learned what I know of the organization and management of a railway surgical department. I have profited by your experience and the discussions on this floor, and I am glad of the opportunity to stand here and acknowledge the debt.

Costs and Compensations.

[By G. P. Conn, M. D., Concord, N. H., Vice President National Association of Railway Surgeons, Chief Surgeon C. & M. R. R., Local Surgeon B. & M. R. R.]

The conditions under which people live are such that but few have reason to believe that all things will come to him who patiently waits. The day has gone, if it ever existed, when men or corporations can quietly sit down and wait for business and prosperity. Progress in every vocation, business pursuit or scientific attainment, can only be secured through an untiring disposition to overcome every obstacle and clear the way to secure the best at such a cost that the results will be the true compensation. In no otherbusiness pursuit or vocation has this truism been more frequently exemplified than in matters pertaining to railroads and their management. It was no sooner deemed certain that by reason of increased safety to trainmen and passengers the compensation would cover the cost and allow a dividend, than the power brake came into general use. So too the increased comfort of a long journey in a Pullman or Wagner car has not only overcome the cost of the cars as well as the increased weight of train service, but compelled their adoption by every road having long through connections, and the projectors of this service are reaping their compensation in steadily increasing dividends upon the capital invested.

We can all remember when the iron rail of from 50 to 60 pounds to the yard was considered the standard, and light rolling stock was to be found on every line, while a steel rail of 70, 80 or even a 100 pounds per yard is considered necessary for all first-class roads of to-day. Now as rails are bought and sold by the ton, it follows that the increased weight is no inconsiderable item in the cost of construction, and yet in the adoption of these heavy rails there is such complete immunity from some of the chances of derailment, opportunity to use so much heavier locomotives, and increased tonnage per mile, that the compensation is greater than the cost.

A well conducted railway medical and surgical service that has the interest and welfare of employe and employer always in sight will be a considerable item of expense, yet who will be so rash as to say that compensation has not been received when humanity is relieved from suffering, the interests of the corporation are served, and the good will of patrons and employes is secured? So far as I can learn such has been the result on the Missouri Pacific, the Wabash, the Pennsylvania, the Baltimore & Ohio, as well as on other roads where the employes receive the same care and treatment that would be accorded the management under similar circumstances. When every victim of disaster or disease has the best care and medical and surgical skill the country affords such work can safely count as a dividend on all classes of stock. Thus a medical and surgical administration conducted with due regard for all concerned will become a gilt-edged investment that to the employe is an angel of mercy and to the management a satisfactory solution of an important problem, while the stockholders will have a feeling of supreme satisfaction at having performed their duty to their fellowmen without loss to themselves.

The relief department of the Baltimore & Ohio, the Pennsylvania and other roads entails liberal expenditure of money, which, directly or indirectly, is contributed by the roads, yet the compensation of having secured a happy, contented and industrious complement of employes who have a due regard for the welfare of the road, and intelligent oversight of the rolling stock a personal interest in the prosperity of the line, thus cutting down the operating expenses and the construction account, must more than cover the cost. The half million dollars annually expended by the Baltimore & Ohio railroad and the $8,000 per month collected from the employes of the Missouri Pacific and wisely expended for their benefit when sickness or accident overtakes them, have, in the increased happiness and longer life of the individual, a compensation far beyond the outlay.

While we are considering the mutual relations of costs and compensations to the management and employe, let us not forget the patrons of the road. They are the people whose connection with the railways of this country makes dividends possible, as well as the construction of new roads a necessity, and who with a patience born of long suffering continue to ride over our lines at considerable cost to themselves, although without much compensation in the way of comfort or healthful surroundings. They certainly deserve some consideration from an association like ours. Very few coaches have anything like an adequate system of ventilation for a full complement of passengers, neither are the employes usually instructed in the management of such as exists. Our train service has not advanced so rapidly as the other departments. Elegant and expensive coaches are the rule, and we boast of our fast trains, but with steam heat the brakeman or other person in charge must be instructed to attend to other duties than simply calling the names of stations and making the journey a pleasant pastime for the young lady passengers. Unskilled men would be of no service as car inspectors, neither are they serviceable in running trains, and as the car inspector must be trained for his work, so should the brakeman receive instruction regarding the heating and ventilation of his coaches. The complicated system of heating now in use involves the exercising of a greater degree of intelligence and judgment on the part of the brakeman than was formerly called for.

The ordinary coach has a capacity of about 4,000 cubic feet of air space, and a seating capacity for 60 passengers. With all the seats occupied and with no fresh supply, the air will become exhausted in a single minute, and is then contaminated and unfit to breathe unless renewed. Fortunately coaches are not constructed so that it is possible to have them hermetically sealed. In view of these facts can a car be so constructed as to secure a renewal of the atmosphere therein as rapidly and constantly as the demand requires? Improvements are being made from year to year, yet all sensible people agree that the desired result has been but imperfectly secured as yet. In justice to the master mechanics who construct our cars it should be said that until brakemen and others are instructed in the use of our present system of heating and ventilating the result will always be unsatisfactory.

Will this extra work pay? Will the compensation cover the cost? It is generally conceded in the east that a dining car does not directly pay the expenses incident to the cost of the service, yet it is well understood that indirectly it pays a large dividend in advertising the line over which it passes; therefore the cost and compensation are equalized. And while clean cars and well ventilated coaches require considerable outlay of money, yet to a through line the advertising thus secured will return a good dividend on the amount invested and afford the management as large a compensation as would a liberal supply of printer's ink invested in describing the picturesque, the beautiful and the other natural advantages of their line. On the other hand, suppose the printer's ink be used in showing up, on a through line, the unsanitary condition of the cars, the poor ventilation, the filthy condition of the water closets, the fact that the car windows are so covered with dust and dirt that the curtains are unnecessary, that trainmen are noisy, uncivil, etc., how long would it be, in this enlightened age, before the tide of travel would set toward the rival line offering better hygienic accomodations? Corporations, like individuals, do not work altogether for glory, but for the money there is in it; therefore every faculty of the management is brought to bear in the endeavor to secure for their respective lines such business facilities as will allow them to earn operating expenses and a dividend. To do this in passenger work will soon require that hygiene and sanitation shall be considered in the construction of cars as well as in looking after their care while in service, for the public are becoming critical on these matters.

That those connected with the train service should be required to do this work is not questioned; but until such employes are properly educated in the work and have some knowledge of the elementary principles of hygiene and sanitation it will be useless to expect anything like a system in car cleaning and train service that will prove satisfactory. This assertion need not frighten any one, for the first principles of hygiene and sanitation are in no wise complex, neither do they present a problem that cannot be solved by a little forethought and a comprehensive and common sense view of the situation.

To say that a coach or a house should be kept clean in every part and place is a very common-place observation, and still it involves one of the first principles in sanitation, as well as in surgery and in medicine. It ought not to be a very severe task to instill into the mind of the car cleaner this principle, nor to make the average brakeman understand that he will be held responsible that his car is clean, and for the best use of such devices for heating and ventilation as may be found about the train; yet his attention must be called to such facts, and there must be some one who will call him to account whenever untidy and unwholesome conditions are to be found.

This is an important department and there should be at its head an expert in such matters, the same as has been found necessary in freight, passenger and operating bureaus. To do this and not excite friction among employes is a matter requiring tact as well as a thorough knowledge of the requirements of the service. This last fact is an important one on lines running coaches many hundred miles and through considerable variation of climate, as the longer a continuous run is made, the more care is necessary to prevent the coach from becoming unwholesome and unhealthful. Unfortunately, train crews are often shifted, even when the whole train makes long distance journeys, as the reasons for any untidy conditions are usually shifted from one division to another; yet men should not be required to work continuously more than a reasonable number of hours. Therefore it would seem all the more necessary for the management of all through lines to adopt some common mode of enforcing good hygienic regulations.

Every member of this association has more or less knowledge of the sanitary condition of the cars, depots and grounds of the section of road he has occasion to pass over, and without special trouble to himself may become more intimate with the existing conditions, and through him the surgeon-in-chief or the general manager can obtain by a system of reports, at comparatively small expense, a knowledge of the hygiene of the road as well as what may be necessary to reform any special neglect. The same machinery working from a central office can be made to accomplish a great deal toward satisfying the public when comfort of traveling is under consideration. It is true this work may not be so eminently satisfactory to the surgeon as the saving of life by reason of some brilliant surgical operation. However, the patron of the road who is enabled to make a journey across the continent without suffering the discomforts arising from the lack of an intelligent care of the heating and ventilating of coaches, and who can arrive at his destination in a good sound, healthy, vigorous condition, ready for business so soon as the train comes to a full stop, will never forget that line nor fail to draw congratulatory conclusions regarding the management whose intelligent care has been the means of rendering such results possible. It may be considered an aphorism that the patron of the road, as well as the employe, does not intend to have any use for a surgeon. It is only when misfortune overtakes the people that they are glad to make our professional acquaintance, and having occasion to call our attention to their condition they do not feel especially in a mood to congratulate the management on the fact that they have been injured while in their service. Our duty to such as have been injured is plain and will be understood by every member of this association.

Modern surgery demands that every known precaution shall be taken to prevent septic infection, and as railway injuries are generally of such a nature as to render it probable that something of an infected character may have been in contact with the wound, we are in duty bound to destroy, as far as possible, such septic influence by freely using well-known antiseptic remedies. This being our duty to those who have been so unfortunate as to be injured, are we not under some obligation to others who are more fortunate and escape injury by accident? Have they not a claim upon us as an association educated in these matters and therefore competent to give advice and instruction in all that relates to hygiene and sanitation? More than this, are we not under a moral obligation to the management that employs and pays us for looking after the interests of its line? Shall we not endeavor to secure such hygienic conditions along the line and in its coaches that the road will not lose caste and patronage by reason of sanitary neglect that a little effort on our part might easily prevent?

The cost of such supervision would be trifling, while the resulting increase of patronage, good will and hearty commendation of the public would be a compensation that can scarcely be estimated.

By associated effort, rules and regulations looking to the comfort of passengers as well as regulating the transportation of invalids, might be effected. These being the same in all parts of the country and issued by every road would not be esteemed especially arbitrary, as such orders might be if promulgated by a single management.

I suppose no one will for a moment question the right of the public to demand that those ill with contagious and infectious diseases shall be excluded from the coach occupied by those who are free from such diseases, and that a car which has been used to transport one or more cases of such diseases shall be properly renovated, cleansed and disinfected before it shall take its place again on the line and be occupied by an unsuspecting public.

Who else can conduct such work and give directions regarding the manner in which it shall be done and determine when a coach can be safely occupied, as well and economically as those whose education has been in that direction? Having such education shall we withhold our advice because it does not directly and distinctly belong to the art of surgery? Shall we wait until the management calls our attention to the fact that a reform in the sanitation of its road has become necessary? Does the head of the passenger or freight department wait for the general manager to suggest how the service can be improved or the business of the line materially improved.

It is true our association is in its infancy; that but little concert of action has been developed, and in some sections of the country individual members have contributed but little time and effort to improve the efficiency of a surgical department. It is also true that before any great advancement can well be made it must be fully demonstrated that the compensation will directly or indirectly cover the cost.

The whole matter may be summed up in a few words, viz.: Does the public good require any services of this nature? And we may rest assured that when public opinion becomes thorougly aroused upon this or any other subject, whereby a change is demanded, something will come of it, as there always arises some ruling genius whose fertile brain has the power to suggest a means to the required end. Under conditions like these there may be a decided sacrifice of individual opinions; business relations and commercial interests may seem in danger of being compromised; the cost may seem extravagant—yet when public opinion demands a reform by reason of educated public sentiment it is sure to be effected, and it matters not whether it emerges from the formal dignity of the social circle, has been surrounded by the sanctity of religious creeds, was a political hobby, a business method, or an antiquated system of transportation, the effect is the same. Progressive ideas will prevail, effete notions will give way to a higher standard of work and efficiency; therefore, directly or indirectly, the compensation is commensurate with the cost.

It is unnecessary for me to ask your attention to the atmospheric conditions so often to be found in cars making long distance connections, or to the untidy conditions that often are present about the buildings and grounds of railway stations. You are all familiar with such scenes and doubtless recall the results of experimental investigations made by Drs. Reed, Kedzie and others.

How often when riding upon trains do we overhear the passengers commenting among themselves upon the unsanitary conditions surrounding them. And unfortunately for the good name of the road, the criticisms are directly or indirectly aimed at the management-directly because these people are suffering from the discomforts of an untidy apartment and an unwholesome atmosphere, and indirectly because the average trainman seems to be utterly unconscious and oblivious to the fact that he has any duties to perform that would improve the situation.

In this connection I would suggest that the managers of our roads are as liable to suffer from unsanitary conditions as any other class of people, for the reason that in the performance of their duties they are obliged to make long distance journeys under the same or similar conditions as the traveling public, while in most instances they are engrossed with matters of business and the mind is intensely occupied. As medical men we are well aware that the mind overworked and weighted down with business cares has a material effect upon the body, and under such circumstances there is but little or no resistance to the invasion of disease. Some will break down prematurely with the best of care, but the majority should retain the vitality necessary to longevity.

In our association with these men have we no duty to perform? A few days since the Medical Times and Register, referring to one of the brightest and most promising members of our profession on whom the doors of an asylum had closed, said: "What an ending for such a life! Hard work, no rest, no Sabbath, no vacation; by such means his powerful intellect carried him to the forefront of his profession; but at last outraged nature reached her limit of endurance, and the breakdown was complete."

Such cases are by no means rare nor entirely confined to professional men. Our high pressure system of business methods requires a sound mind in a sound body, without which the most brilliant and progressive will succumb to the intense strain and activity necessary for decided success. It may be a lesson we are slow to learn, one that has to be enforced by an occasional thrilling fact, as witnessed when some man in the full tide of a successful business career suddenly drops out and is seen no more in his accustomed place—that the most robust physique has its limit of endurance, that the best mental fibre may succumb to undue stress at a single point.

With all the beauties of our vaunted civilization are we not in some degree responsible for many pathological phenomena? However zealous we may be in combating the thousand and one ills and accidental misfortunes of our race, the claims of sanitation ever loom up before us and there is still the problem of hygienic science with its wonderful possibilities only partially solved.

The question of the prevention of accident and disease is too broad to be discussed in a meeting like this, but the consideration of what may be done to increase the efficiency of the railway service and place it upon a more substantial basis by means of a more intelligent appreciation of the manifold dangers to health that surround the management and employe is a matter that should be met in the same manner as any other business problem. Theory and practice must coincide, the æsthetic and sentimental cannot claim precedence, harmony of action must prevail at every point, and the good of the service must be the acme of personal ambition. It is a well known fact that in army life the health of the soldier is of such prime importance that the officers are instructed never to lose sight of the sanitary conditions surrounding the men, and in view of the fact that railways are common carriers and are held responsible therefore, it is equally important that the great army of employes in their service should possess a sound mind in a sound body. When considered in this light it becomes a simple problem, complications are eliminated, natural forces prevail over artifical methods. The cost may be no inconsiderable an item, but the compensation will be sufficient to allow a large dividend upon the investment.

DISCUSSION ON DR. CONN'S PAPER.

Dr. R. Harvey Reed, Mansfield, Ohio—Dr. Conn's paper is certainly one of great interest to every person. It is not only interesting to railroad surgeons, but it is interesting to every passenger who rides on our trains every day. And when we consider the great number of people who live on railway trains, so to speak, and then consider the large number of people who die annually of consumption, who come from the east and the west, and from the north and the south, and are pent up in these cars with those supposed not to have consumption, it is a question of great importance whether they should be conveyed in these cars without proper ventilation, or not. I do not desire to make any criticism on our railway management; a great variety of cases are called to the attention of the general managers of railroads and they have a great many perplexing things to contend with each year. This matter increases from year to year and their duty becomes greater as the railway mileage of this country increases and the demands upon them are necessarily larger. At the present time we have some new features introduced on our railway cars. Steam has been introduced into our passenger coaches and vestibule trains, and with the vestibuled trains we have—instead of one car being separated by itself—the entire train open, as it were, like one vast corridor from the hind car to the front. Now it requires a different method of ventilation under these circumstances, and more careful attention. Take the ordinary brakeman—he knows nothing about the proper temperature or correct ventilation of cars. The company may have a thermometer hung up in each car, but that signifies but little. It tells the degree of heat, but not the amount of pure air introduced, or the amount of foul air taken out of the car.

Another point. With the steam radiators as they are on some of our railroads we have people complaining of being cold when the brakeman turns on the steam; then in a few minutes somebody complains of being too hot, when he turns it off and the next thing they are frozen. What I want to say is this, there should be a man employed whose duty should be to attend to the heating and ventilation especially, and should not only be educated to know how to regulate the temperature and also the supply of fresh air and exhaust of foul air; but he should have coaches so built that this could be readily accomplished without the necessity of open windows, doors or transoms, and at the same rime keep a regular temperature throughout the car and a bountiful supply of clean fresh air for every passenger, and exhaust the foul air as fast as it is produced.

The Union Hospital Plan.

[By E. R. Lewis, A. M., M. D., Kansas City, Mo., Secretary National Association of Railway Surgeons.]

Economy must constitute an important factor in all business enterprises, so long as man is required to "eat bread by the sweat of his brow." As it is impossible to eliminate cost from any department of railway service that problem in regard to the hospital system must be faced first; and how best to bring it before the executive departments of the great railway systems of our country has very much puzzled many. I recognize in the heads of our railway systems men not only of marked abilities in the care and successful management of their corporations, but men quick to perceive and ready to execute even an order that may be a deviation from the accepted rulings of the court, so to speak, provided advantages to all concerned can be shown by the exchange proposed; and in suggesting a change which carries with it both economy and humanity I do so with the profoundest respect, believing that all differences are honest ones. The objects we seek call for the acceptance of only partially proven facts. For no progress can be made without a venture suggested by intelligent reason, and in order to be willing to progress or change we must first be dissatisfied with our present methods and willing to improve upon old and imperfect ones. I presume to call the attention of this association to the report of the late meeting of railway claim agents for comparison of methods and results. We find they have made much progress, but that those who represented roads with organized hospital systems made the best and most satisfactorily showing from the standpoint of both employer and employe, at the same time offering the traveling public the best attention after unavoidable accidents.

I am pursuaded that the first question asked by the executive of one of these corporations in considering this subject would be: "Would the establishment of a hospital system be of any benefit to us other than purely philanthropic and humanitarian?"

I reply this question has been answered in the affirmative by the companies who maintain their own hospital systems. But one question can be raised by any corporation operating less than 500 miles of road, and that is as to the first cost of ground and buildings necessary to such a service. It is to such roads I believe the union hospital indispensable; and to larger corporations far preferable.

It has been proved that the hospital system can be made practically effective and adapted to the end sought, even if maintained by a single corporation of limited mileage, and can we not see the diminutive per capita of a union of roads, increasing the members and diminishing the cost? For the same service will treat daily one or two hundred as easily as one-fourth the number.

Can the hospital system be carried on by assessment without burden to the assessed? In answer to this question I have but to call to our aid figures which show that it is not only not burdensome but conducted at one-third to one-half the cost of individual accident insurance plan according as the insurance is for loss of limb or life, as some companies provide accident insurance in connection with the hospital treatment. Which of these plans is best is on trial now.

The necessity of a railway hospital system is inherent in the nature of the business, and a railway corporation carrying on its business without provision for the accidents which must accompany it does not seem to abound in the milk of human kindness. I care not if that protection comes solely from the monthly assessment of the employe, the employer only acting as guardian or trustee, to see that each one gets the best care and attention that can be purchased ; it shows an interest which cannot be denied even in courts of justice where railway corporations often fail to get justice on account of prejudice caused by apparent lack of humanity on the part of their managers.

The object of a hospital system is to save. I care not if you say money first, for it only does that by unity of action. It saves lives, limbs and function to those who are injured, giving better facilities to compete with disease, accident and death.

It is useless for surgeons to waste time discussing the advantages the hospital plan offers for the proper treatment of the injured. We all know to our sorrow what hotel and boarding house accommodations are for an injured man, and the disadvantages incurred in the man's own home ; and I dare say that the most of us if badly injured would rather be taken to the graveyard at once than later under such conditions.

In time of peace prepare for war. It would be folly to think it possible to carry on the railway business without accidents—accidents unavoidable from the nature of the business. For such contingencies provisions must be made which are to the best interest of both employer and employe. To ignore the interest of one is but to reflect upon the honor of the other. The employe assumes risks when he engages in an extra hazardous business, the capitalist assumes risks when he invests in a hazardous business, and I conceive the solution of the problem to be that plan which is both equitable and just to all. Our lots are cast together in whatever business it may be, and justice, not might, must prevail.

We all ought to or do carry accident insurance. The minimum cost is twice that required by the assessment plan which provides against the accidents incident to our business, and the money received from the insurance can never provide that care and attention guaranteed by the assessment plan as practiced by railways in the Mississippi valley. I am sure even that plan can be improved in effectiveness and economy by the adoption of a proper union hospital plan. Is there a city of any size in our country that has not a union depot? If so, is it not looked upon as being behind the age? Unsatisfactory to the traveling public and expensive to maintain, the separate depots carry on even a small business with inconvenience. Let a railroad be excluded from the union depot of any city and estimate the disadvantages to both the road and the public. We are living in an age when time only seems to count. Distance presents but few if any drawbacks. Transportation of the injured and its often imaginary bad effects count for naught compared to the advantages to be derived by the injured when properly treated in a properly conducted hospital.

The theory so often advanced by older railway systems that employes prefer their own homes and domestic surroundings to any accommodations which can be furnished by any hospital is not a correct representation of the facts, so far as concerns those railway employes who are familiar with the railway hospital plan of the Mississippi valley. I can give you many instances to prove this incorrectness, but deem it sufficient to call attention to an accident to one of our own number present to-day, whereby he lost a leg.

When it was determined that limb must be sacrificed to save his life he consented to be removed from his own home, comfortable and complete in every respect, to the railway hospital, many miles and hours distant, which experience had taught him offered many more advantages for recovery than any home could afford. I know employes in our part of the country who refuse to work for a railroad that does not maintain an employes' relief association or hospital. Even the most reckless railway man stops to think: What will become of me if mangled and torn at my post of duty? "Self-preservation is the first law of nature," and but few occupations can suggest this adage more frequently than that of railroading.

Providing accident insurance does not fully satisfy the injured. To be skillfully and promptly cared for, thereby protecting the life of the injured, presents many advantages to most of us over the plan that guarantees only a widow's dower or an orphans' inheritance. That dead men are often cheaper than living maimed ones we grant you, but that should not prevent the saving of life at the expense of a limb, or eye, or from a monetary standpoint. The majority of injuries to employes prove contributory negligence, but few would plead that as the injured was a party to the accident he should not be entitled to the protection of an organized system to which he was a contributor, and a system which should present advantages not otherwise attainable by even the head of the operating department himself.

My idea of a union hospital is not a hospital owned and controlled by one corporation, which receives the injured from other companies as well as its own, charging a fixed amount for board and professional services, etc., but rather a hospital whose employes, like those of a union depot, are the representatives and employes of the several corporations maintaining it, and where the clinical register and other records are faithfully kept for the use of all concerned. The management of the service is done by the chief surgeons or their legal representatives, who at all times have access to the records of their respective patients and the general charge of the institution; the expenses to be borne according to schedule fixed by the directory so that each employe is the servant of all, not one.

In order that the professional personnel of the hospital should be first-class it would be necessary to locate the hospital at a point where first-class professional skill can be had at all times and for all complaints. No man or two men, however experienced, can furnish the skill necessary to cover the range of conditions presented for treatment in a modern hospital of any kind, much less a railroad hospital where at any hour we may be called upon to point out a cerebral localization or perform a hip joint amputation.

The old remark that it was queer that all large rivers ran by large towns is suggestive of the fact that these large hospitals can only be successfully maintained in the large and populous centers where the best of professional skill must reside. That this skill can never be controlled by any single industry is recognized by all chief surgeons. The value of expert professional service is rarely underestimated, even by non-professional men, and after reading the responses from general managers and general superintendents to the circular letter sent out by our committee on transportation, I noticed but one reply from roads having hospital systems which seemed to underestimate the service of professional men not devoting their entire time to the company's business. That was from an officer only recently placed in control of his road, and I feel that he only needs a single case of slight injury to the female coccyx to elevate his opinion of his local and consulting surgical staff. I use this illustration because a very prominent general manager on one of our largest railway systems wrote me two years ago that he would be glad to help our association all he could because his company had recently had a very unfortunate experience with a lady who claimed his road had injured her coccyx.

The Care of the Injured by the Pennsylvania Railroad.

[By I. P. Klingensmith, M. D., F. S. S., Surgeon Pennsylvania Railroad, Blairsville, Pa.]

The intimate association of the Pennsylvania railroad with every industry and business interest of a vast area of this country, as well as its importance as one of the leading corporations, at once merits for its system of caring for its injured employes and passengers a respectful hearing. This great corporation represents not only the highest development of railroad science in all that concerns the practical operation of its vast system, but also the strength of perfected organization, so that there is nothing experimental characterizing its practical workings. No road anywhere is better equipped and better managed than the Pennsylvania railroad system, making it one of the greatest transportation marvels of the world. It is a monument of American skill in one of the greatest departments of human industry. Success is the best index of its prosperity, and its splendid strength must ever be a source of pride to the sections of country through which its lines extend. The Pennsylvania railroad, being one of the greatest arteries of trade in the country, necessarily employs a great army of men and daily transports thousands of passengers over its lines. The application of immense power and the wonderful rapidity with which passengers and freight are carried are accompanied with danger, notwithstanding the high degree of perfection attained in the construction of the rolling stock of the company and the great care exercised by the officials for the safety of its employes and passengers, and accidents are constantly occurring, necessitating the employment of surgeous to properly care for the unfortunate injured.

Railway surgery is rapidly becoming the leading specialty of surgical practice, being a subject of vital importance to both employer and employe. The general practitioner, unaccustomed to accidental or railway surgery, is poorly equipped for this kind of work. A large number of instruments and apparatus are not in themselves sufficent, but to subserve the real purpose of his avocation a training fitting him for this special field of labor becomes a necessity. As our railroads are managed by the best talent in the country the services of the skillful surgeon are being duly appreciated and he is now recognized as an economical element and an integral part of our great railway system. The policy of the Pennsylvania railroad in caring for its injured employes and passengers is to employ surgeons at all important points whereaccidents are most liable to occur. These surgeons are appointed by the general superintendents upon the recommendation of the division superintendent solely on account of their professional skill to accomplish surgical results and with due reference to their ability to perform honorably the duties required by both patient and company.

The appointing of company surgeons had its origin during the early history of the road, the first surgeon, Dr. John Lowman of Johnstown, Pa., having received his appointment from President Edgar Thompson in 1858, and he still continues in the active service of the company. As the lines of the road have been extended, thus increasing its passenger and freight traffic, additional surgeons have been appointed from time to time, until now there are more than 200 regular appointed surgeons on the divisions east of Pittsburgh and Erie alone. In case of accident the nearest company surgeon is summoned, who takes charge of the case and renders the necessary surgical aid, after which, if the patient or his friends so desire, he is removed to the nearest hospital. Otherwise he is taken to his home, where the surgeon continues his services. Whenever indicated a professional nurse is furnished at the expense of the company, which also pays for all surgical supplies and drugs. Every case of injury coming under the observation of the surgeon is promptly reported by him to the division superintendent, who reports the same to the general superintendent. This report is made on the following official blank:

Pennsylvania Railroad Company.
....Division.

Surgeon's Report of Accident.

....189 ...
....
Sup't..Division.
Below please find report of accident to
which I was called by ....at.............m.,
on..189....
Name..
Residence...
Occupation.. Age..........................
Height .... feet.......................inches. Weight...............
Pounds. Complexion...................................... Hair.........................
Eyes.. Chest measure (if practicable)
.... Scars and marks ....
.... General characteristics.......................................
Married or single.. Date of accident
.... Where received.......................................

Cause of Accident ....
....
....

Nature and extent of injuries, ...
....
....
....

What services were rendered and what disposition made of patient; state place where patient can be seen within say 24 or 48 hours. ....
....
....
....
....
....
....
....

If living give prognosis, with probable duration and extent of disability. ....
....
....
....
....

What was said by injured party as to cause, etc. ....
....
....

Remarks. State any and all information bearing on the case not given above. ....
....
....
....
....

If surgeon had assistants give names and addresses. ....
....
....

....
Surgeon Pennsylvania Railroad.

The Pennsylvania Railroad company, being a most liberal contributor to the general hospitals which are located at short intervals along its lines, is able to afford to its injured employes and passengers gratuitous hospital facilities of the most ample character. In addition to this, surgical rooms have been established by the company at intermediate points, where injured persons are first taken. These rooms are fitted up with due reference to the application of antiseptic surgery, and are furnished with such supplies as are necessary to properly care for the injured. It should be borne in mind that the cost of caring for the injured is not a factor, the policy of the management being simply under all circumstances to render the most efficient aid regardless of expense.

Prompted no doubt by a humane feeling to render early aid in injuries and accidents, each locomotive is supplied with a tin box 6½ inches long, 4½ inches wide and 3½ inches deep. The following is printed upon the box:

PENNSYLVANIA RAILROAD COMPANY MEDICAL BOX.

To be kept in each locomotive and used in case of accidents only.

OUTFIT.

1 rubber compress, 1 package (1 ounce) of absorbent cotton, 6 rolls of bandages, 1 pyramid of pins. This must always be kept up, and when anything is needed requisition should be made at once.

DIRECTIONS.

When arm or leg is crushed, causing hemorrhage, pass the compress around the limb immediately above the injured part in case of rupture of an artery, or immediately below the injured part in case of rupture of a vein, tieing it tightly until the arrival of the surgeon. The rupture of an artery can be distinguished by the color of the blood, which is red and spurts out, while the vein has black blood and flows continuously. For wounds of the head or face apply the absorbent cotton and bind it with a bandage secured with pins.

It is a well known fact that the officials of the the Pennsylvania railroad are men of broad culture and high intellectual attainments, fully imbued with the spirit of progress, and their surgical service is in keeping with the dignity and character of that great road.

DISCUSSION ON DR. KLINGENSMITH'S PAPER.

Dr. W. B. Outten, St. Louis, Mo.—I do not know that I ought to speak on this paper, but it has in connection with it an idea that occurred to me when I first entered railroad surgery. We will admit that the Pennsylvania system is perfection in the matter of its rolling stock. We will admit that the management by its general managers and superintendents is excellent; but to my conception, as far as the medical and surgical departments are concerned, they are run by the superintendent. The question arises, is the superintendent competent to guide and direct what I should do as a surgeon? I admit that the Pennsylvania road is established upon a broad, humane and likewise economical basis, because it does not cost the company much. The point with me is this : If you want the doctor to be made a potent factor in railroad centers put him at the head of that which he knows something about, and let the superintendent run what he knows most about. [Applause.] This is an age of specialties, an age in which no one man can comprehend everything, so that if you want to make the profession as it should be, do as we do out west. You are the chief surgeon of the road, and you are only responsible to the general manager. If you are ordered by the superintendent to attend a case and have gone contrary to his advice, explain and develop that same element which has made the railway men of this country so great and important factors, viz., have the surgical department under your charge and show your executive ability from the time you do it.

I will make the assertion that the present plan of the Pennsylvania system, with all that it accomplishes, does not accomplish one-half of what an ordinary hospital does. In the first place the assessment is, say (take the lowest, a man receiving $50 a month) 50 or 25 cents a month. You agree to give to each employe all the facilities and advantages of a first-class hospital and all the facilities and advantages of every specialty with which it is necessary to aid him in case of injury; likewise all the advice that is necessary. You do all this for a small assessment. You don't end there. The surgeon of the road as he now stands out west is employed solely for his surgical ability and nothing else. He is not employed to assist your legal department, not employed to run down the employe in case he is hurt ; but the surgeon at the present time is the go-between between the legal depart-

LANE LIBRARY

ment and the man himself. I stand here with the absolute confidence that I am viewed by the employes more as their friend than any man in the system. All the surgeons are.

Let us run over an ordinary case in this way: A man is hurt; all the surgeons can say at the time the report is made is that the man is either disabled or not. He simply tells the truth. Now take on this basis any of the organizations you have. You have got the Brotherhood of Locomotive Engineers, the Brotherhood of Firemen and the Order of Railway Switchmen —all have a prominent disability clause in connection with their business. In the event a man loses his leg he is taken the hospital, treated there if necessary for six months or a year. In the meantime he has collected from his order sufficient to provide for his family comfortably. He is given the best of care; the hospital is based upon the plan of doing the greatest good to all. There is not a single exception made. For the last two years there has not been a single lawsuit brought by an employe against the Missouri Pacific road, because he has absolute confidence in his medical friends. Now then, I admire the Pennsylvania system as much as anybody, but it is a fight between your insurance plan and your operating department. Your operating department is the growth of the country; your insurance came from the older countries where liberty of thought and liberty of action do not have eternal sway. [Applause.]

Mr. W. H. Elliott, Savannah, Ga.—I am very glad to hear the point made by Dr. Outten as to whether the surgical department should be run by the superintendent or by the chief surgeon. I am glad to state that in the case of the Central Georgia railroad the chief surgeon is allowed to run it, and whatever the system is on that road I am responsible for it, because I am left untrammeled. I report to the general manager and am responsible to no one else.

Dr. W. A. Phillips, Salina, Kan.—I have had occasion before to bring this matter up for discussion, but not in the form in which it has come up to-day. I was glad to have the opportunity of listening to the remarks of Dr. Outten. He is a man who knows whereof he speaks; he is a man who has gone from the position of being controlled by the superintendent of a road to one of independence, and reports now only to the general manager of the road. I wish to speak now on the question whether the chief surgeon should be the controlling element or the superintendent in the surgical department of a railroad, and in so doing I will briefly speak of my experience with four different railroads in which the two plans obtain. They are all large western railroads, not one of them less than 3,000 miles long. On three of them the hospital plan obtains. On the fourth it does not obtain. The patients are treated by local surgeons, the treatment being under the supervision of a surgeon who is well known to you here, whose effective work bears evidence of the value of the plan. I also have an association with the railroad with which Dr. Outten is connected, and I can bear testimony to this, that my relations with that road have been more satisfactory than they have been with the other three, two of which are run on the same plan. I lay it entirely to the fact of its independent system. While the Pennsylvania system gives excellent results in many ways, I do not think it gives the independence that should be had. I do not believe its results are as good as obtained by the other plans.

Dr. J. B. Murdock, Pittsburgh, Pa.—The Pennsylvania road seems to be on trial, and being a servant of it just as much as Dr. Outten is on the Missouri Pacific, I feel that I ought to say a word in its defense. I do not pretend to know much about the different systems. I presume that the management of the Missouri Pacific are business men of intelligence and that they run their road in a business manner and adopt the best plan in order to care for the sick in the best manner. I presume also the Missouri Pacific people know how to take care of their sick. The plan which is pursued by the Missouri Pacific is undoubtedly a good one and works good results, but it does not necessarily follow that the Pennsylvania road has a bad system. I only rise to make the statement that I believe that the injured on the Pennsylvania road are as humanely cared for and as skillfully treated, and that their surgeons are as well treated as those on any railroad in the country.

In times of accident, on occasions when sick men have to be cared for, the surgeon consults the superintendent, who listens to him and usually does what the surgeon asks.

In regard to costs and so far as intimated that the Pennsylvania road does not pay out much for the care of its sick, I will say the fact is that it pays out everything. It does not ask 50 or even 25 cents per month from its employes. It gives them everything. Without criticising the management of any road, I will say that while I believe the plan suggested by Dr. Outten is good on the Missouri Pacific, and the plan mentioned by Dr. Elliott is likewise good in Georgia, still I maintain that the management of the Pennsylvania road know what is good for them, and the surgeons connected with this road are well treated.

Dr. C. H. Hughes, St. Louis.—There can be no question that the Pennsylvania system of managing its sick and wounded is a good plan, but the question is whether it is the best plan. Now it has been found in all medical experience, in the experience of army and civil life as well, that medical matters are always best settled by medical men. [Applause.] This in practical experience amounts to an axiom. It is a self-evident truth, and one of the greatest embarrassments of our profession consists in the fact that medical men have permitted themselves in this country to be placed against the wall and to take a back seat upon the specious plea that they are not possessed of average executive ability. This is a mistake. The same capacity that enables a man to master the intricacies of his profession, medical or surgical, will make of him an adequate executive officer if he wills and if he tries it.

I know of the Missouri Pacific system. I know of its excellent surgeon-in-chief. We were boys together. We were raised together; perhaps this may account for his having been such an excellent man all his life. [Laughter.] We have often slept together. There is one point I wish to make about the hospital plan, and that is this: The Missouri Pacific system provides for its employes a hospital plan, and in the acceptance of that by its employes for preliminary treatment the individual comes under the environment of the railroad. He is kept away from the influences of adverse environment without, and is predisposed as any man is toward those who have done him a hospitality. If you get a man under your roof and treat him with the hospitality of modern civilized professional life you predispose him in your favor. When he has accepted this medical and surgical attention from the company you have prima facia evidence when you go into court and prove to the jury that you attempted to do for this man the best you could. You have shown the part of the good samaritan and that you have been governed by the kind of feeling which makes its impress upon the jury.

Dr. George Ross, Richmond, Va.—I was exceedingly glad to hear the paper. It seems to entirely cover the ground. I have also listened with marked attention to the remarks of Drs. Outten and Hughes. There seems to be a difference in the method pursued by the Pennsylvania and Missouri Pacific roads, as I understand it, they being two distinct organizations. I simply want to say for myself and the corporation I represent that the Richmond & Danville railroad is distinct in some things. We have no tax upon the men; we therefore have no antagonisms in the way of assessments I believe that is desirable for the corporation. It shows an interest on the part of the corporation in the men. All the charges that are made by the corporation are a gratuity to the men and they recognize that fact. I think the doctors on the Richmond & Danville system are kindly to the men. The chief surgeon is responsible to no one but the general manager. Of course there is of necessity and ought to be a constant intercourse between medical men and the executive officers in charge of the transportation department. That is right and proper. Medical men ought to be the friend of the wounded man. I am sure if they do their work properly and recognize their position fully that this is so. When medical men have been candid to them they will find these men their best friends for the adjustment of any legitimate claims.

I do not think any railroad company should deny proper charge against the company if an injury can be properly attributable to any defect in the running gear of the road, and under such circumstances when a company is chargeable with an accident and is held accountable and it recognizes it, these matters are promptly settled and the employes rarely have cause for damage suits. In Richmond, where Dr. Brock and myself work together, we never have damage suits with the employes. We always settle them in the same way. It obtains all over the Richmond & Danville system. I do not believe the doctors of any corporation ought ever to be put on the witness stand except as to witnesses of facts. These facts can be testified to by men other than surgeons. The railroad surgeon should be required to attend to the duties of the sick and never ought to be put on a witness stand as an expert. So in the discussion of this paper with the legal department of my own system I have emphasized that fact and have avoided surgeons from possible insinuations brought against them occasionally. Another point I want to specially allude to. Lawyers occasionally take exception to one thing, viz., a desire on the part of doctors to get at the truth. They say we should not put on our report the testimony of the man who is hurt and as to how he got hurt. I maintain that there should be a statement of the man who was injured, as to how he got injured, whether injured by reason of his own carelessness or the carelessness of somebody else, taken down in his own language at the time of the accident as near as can be gotten, and it should be a matter of record for the company, not to be exhibited in court or to the lawyers on the other side.

Dr. George J. Northrop, Marquette, Mich.—The only restriction placed upon me when I first took charge of the surgical department of the road I represent was about three minutes' conversation with my general manager in which he said, "I want you to run the surgical department, and I want to know nothing about it except that it is run."

With regard to caring for the sick and the injured (the injury being received while on duty), monthly assessments, etc., our company pays for the time in which the man is disabled. We have no company hospital, but I have arrangements with all the hospitals that are accessible. Where men are cared for in the hospital a different arrangement is made in the matter of settlement; if a man goes to a boarding house or to his home his pay goes on, or he may be able to care for himself. We require no contract from our surgeons; we have no fee bill. I have to audit all accounts and whatever I approve the general manager will see that it is paid.

I believe in the medical and surgical departments of a railroad, but I do not believe in requiring an injured man to make a statement and sign it. It is not worth a blank in court, and generally it is of no benefit to the railroad company. It is desirable to get a correct account of the circumstances of the injury, to know actually whether the man ought to be blamed or the company or some of the employes.

It seems to me our time could be better occupied in reading and discussing papers concerning how to properly care for the sick and injured rather than going into the details of the general organization of the systems on the different railroads. [Applause].

CHAPTER III.

CRANIAL INJURIES.

The Surgical Treatment of Injuries of the Brain.

[By Charles H. Merz, A. M., M. D., Sandusky, Ohio.]

The indications for the surgical treatment of cranial injuries are not, unfortunately, always so clearly defined as we might wish them. Lest the title of my paper should lead to the impression that I expect to treat of the general topic of cerebral localization, truly a most interesting one, let me announce in the beginning that my inquiry is directed to the means for clearing away the doubts that cluster about the plan of treatment to be pursued after the receipt of cranial and inter-cranial injuries. I desire to be excused from considering the brilliant operations for brain tumors and abscesses. Indeed I wish to proceed no farther with the subject than that of considering the immediate surgical necessities of each case and I wish to confine myself as strictly to that alone as the circumstances of the case may permit.

It is true that the advances which the teachings of cerebral localization have made permit the surgeon, better now than ever before, to form more definite and positive conclusions as to the nature and extent as well as the location of intra-cranial wounds. However, even with the knowledge of localities of the brain we now possess, we are not justified in incising, trephining or chiseling without due care as to the strictest antiseptic precautions, for heretofore the greatest barrier to all operations upon the cranial cavity has been the danger of a purulent meningitis. A faithful effort to arrive at perfection in antisepsis must be the basis of all successful cerebral surgery. Owing to the tendency to and the frequency of suppuration, scalp wounds are held, without any just reason, in rather bad repute. It was this unfortunate result that led to the search for a plan of treatment in scalp wounds that would not result in the formation of large quantities of pus and septic infection. The fact is that there are few wounds that heal as rapidly and as perfectly, provided they are thoroughly cleansed and drained before suturing, and are afterwards protected by adequate antiseptic dressing. The vascular supply of the scalp is abundant, and unless seriously interfered with repair takes place readily. Let every instrument and the hands of the operator be scrupulously cleansed before touching wounds of this nature.

Injuries of the head are to be considered especially important because nearly all cases are liable to lead to some cerebral trouble. For the sake of convenience we may consider these injuries in the order of their anatomical relations.

(a) Scalp injuries.
(b) Fractures of the skull.
(c) Injuries of the brain and its membranes.
(d) Injuries of the cranial nerves.

Upon examination we may find the scalp merely contused, a very common condition. There may be extravasation that is circumscribed or diffuse. It should be borne in mind that circumscribed extravasations occur, (a) between the cranial aponeurosis, (b) just beneath it, (c) between the epicranium and the bone. For these conditions but little treatment will be found necessary. Usually the application of cold water and pressure are sufficient to meet the indications. Should the case prove obstinate the swelling should be aspirated or punctured with a small bistoury. In such an event the scalp should be shaved and thoroughly washed with bicholoride, and after puncture a dry iodoform dressing be applied. If aspirated the swelling may be advantageously painted with a nonflexible iodoform collodion. In contused and lacerated wounds the same precautions should be observed. Carefully remove all foreign particles, shave off all the hair, check hemorrhage, replace flaps accurately and apply a dry iodoform dressing.

If the cranium be denuded every clot should be turned out and the wound well irrigated. A bistoury should be inserted into the deepest part of the recess formed by the flap and thrust through it. Into this opening a small piece of perforated tubing is placed and the edges of the wound brought into accurate apposition by sutures. Care must be taken that the sutures do not puncture the aponeurosis. The dressings should be sufficient only to support and protect from the air. Of late I have omitted the use of sutures in these cases and have had every reason to feel satisfied with the result. Unremitting attention to strict cleanliness is the *sine qua non* to success in the management of wounds. Never deviate from the principle of asepticism.

Blows on the head from falls, crushing forces and forcible contact with passing objects when on the railway, etc., are apt to cause fractures of the skull. In making a diagnostic examination after receipt of such injury, the position of any existing fracture should be carefully noted. Sharp instruments are apt to produce depressed fractures at the point of contact. Sometimes the outer table is cracked and the inner depressed.

Falls upon the ground, blows from projecting timbers and car bumpers are most apt to cause fractures of the base.

The possibility of fracture by "contre coup" should be borne in mind. The compound fracture with depression is at once apparent. If without depression, the fissure has the appearance of a red line, but this line must not be mistaken for a suture. Carefully diagnose between simple fracture with depression and concussions with thickened and indurated margins. The depression in a case of fracture is usually more abrupt at one part of its margin than at another; while in contusion the margin is circular, uniform and impressionable to continued pressure.

If a fracture of the base of the skull be suspected the well known symptoms must be given due and careful consideration. These symptoms include bleeding from the mouth, nose or ears, escape of cerebro-spinal fluid from the ears, ecchymosis under the eyes, and paralysis of the seventh pair of nerves. There are cases in which the escape of brain matter may be encountered. It is quite safe to say that when a watery, saline fluid (containing only a trace of albumen and sugar) escapes from the ears we have positive evidence of a fracture of the base. The nature of the fracture and the probable amouut of force applied in producing it cannot be ignored.

In estimating the amount of injury done to the brain, which is always the basis of prognosis, consider well the location and shape of the fracture, as well as the age and habits of the patient. A knife wound is usually local in its effects, but blows and compressive forces will likely produce concussion or fractures of the base and this too without producing much external damage. While it is true that the prognosis of fracture of the base is universally bad, it is by no means fatal.

Treatment must necessarily vary with the cause, whether extravasated blood, depressed fracture or inflammation. See to it that your patient is kept in a dark room, absolutely quiet; the head high, and, better, shaven clean; ice bags applied to it; and cathartics freely employed.

Indications for trephining may be briefly summarized as follows: All fracture of the skull in which there is depression should be subjected to the trephine at once. If there be evidence of intra-cranial hemorrhage apply the trephine immediately with every assurance of success. Trephining if properly performed is not a dangerous operation. When performed under the proper antiseptic precautions it is free from even ordinary risks. Among other points of importance let it be borne in mind the earlier the date of the operation, when once the indications become apparent, the better the prospects of a successful result. The sphere of usefulness of the trephine is daily growing to be of more importance. In every case where there is evidence of local hemorrhage, suppuration or cerebral irritation, after receipt of an injury, I should without hesitation advise the use of the trephine.

A few words as to the operative procedures. Before trephining the patient's head should be well shaven and washed with a strong soap solution, and afterwards with ether. After this it should be enveloped in a towel saturated in a solution of mercuric bichloride, 1, to 1,000. Experience and the confidence growing therefrom give me sufficient reasons for preferring chloroform as an anæsthetic. In some cases the patient is found in an unconscious condition, rendering the use of an anæsthetic unnecessary.

The hemorrhage from the scalp is usually very profuse. To prevent this the Martin elastic bandage may be used and will be found very acceptable. A moderate amount of compression, properly applied, will be found of great assistance.

In all operations on the scalp I have used the horseshoe or semilunar flap. I have found it infinitely superior to the crucial incision. It affords greater room for operative procedures, and affords much better drainage than any other form of incision. After an operation the patient usually lies upon his back, and this form of flap favors good drainage.

Another point worthy of consideration is that of raising the periosteum with the scalp. I have found that better union results and that it is, as a rule, much quicker than when the periosteum is not raised. As to the method of perforating the bone I give every preference to the trephine and the saw. I am aware that the English surgeons prefer the trephine and the saw, while the continental surgeons show a preference for the chisel and the mallet. The trephine applied at different points, and the intervening pieces of bone sawed out, gives a very ample field for operative procedures. I never save the fragments or restore them to place. I much prefer to have the space filled with cartilaginous substance, feeling confident that this cannot produce any subsequent pressure upon the subjacent parts.

As to the duramater, portions of the membrane adherent to the underlying or the covering tissues should be carefully separated. If the case is of recent origin the dura will be found very vascular and injected. Subsequent exploratory measures cannot be properly treated in this paper, interesting as they are. The following instructive case is given from the writer's experience.

Case. Joseph M— is a young man of eighteen years. When eight years of age he was kicked on the back of the head by a horse. The injury was received near the vertex on the left side of the head. At the time he became unconscious from the blow, and lay in a comatose condition for ten days. Unfortunately his particular symptoms cannot now be gained. His parents state that when emerging gradually from his stupor he could not make use of any words, and finally, when he did, he stuttered badly and used the wrong words. There was some facial and brachial paralysis. The wound discharged pus for some four weeks and then healed up. The physicians in attendance were divided in their opinions. One recommended trephining, and two opposed it, so that he was allowed to recover with a depressed fracture of the skull.

As he grew older it was noticed that the boy, who had been unusually bright before his injury, was becoming dull and apathetic. He was inclined to sleep a great deal and frequently dozed while in conversation with playmates. He was given to frequent and violent outbursts of temper, something unusual for him. His memory too became poor. In fact his entire disposition seemed to have undergone a change. About a year ago, while at work, he suddenly fell unconcious and lay in that condition for ten minutes. His face became livid and his arms and legs twitched violently and convulsively. He frothed at the mouth. Of this attack he had no warning. However his epileptic seizures, for such they were, became more and more frequent, and he had distinct aura. His last seizure occured three weeks before he came to me for counsel. He suffered a great deal from mental and physical distress and became despondent. No history of any past or present nervous trouble could be elicited on either side of the family. I examined him carefully and found a distinct depression in the skull about 2½ inches long and ¾ inch wide, near the superior angle of the parietal bone. Learning the history as here given I recommended trephining and removal of the depressed bone.

The day before the operation the head was shaved, and thoroughly washed and scrubbed with bichloride solution just before operating. Upon making the incision to form the flap, hemorrhage ensued. This had to be checked by pressure forceps and ligature before proceeding. Over the depression the scalp had become adherent to the bone and had to be dissected off. As soon as the flap was raised a sharp furrow was seen in the skull, evidently the old line of fracture—extending at one point, as was afterwards seen, entirely through the skull. The periosteum was broken down and soft over the fracture and could be only partially removed from the bone. A one-inch trephine was applied at the posterior margin of the depression, and a disk of bone removed. The inner surface of the disk showed a ridge corresponding to the line of the old fracture. The disk was adherent and had to be dissected from the dura mater. Cerebral pulsation was normal. The dura was thickened and dark in color. A sharp spicula of bone was found projecting into the dura. A second button was removed about three-fourths of an inch anterior to the first, and was also found to be adherent. The intervening piece was removed by means of the saw and rougeur forceps. The edge of the bone was smoothed and all projecting points rounded, with the bone forceps. Hemorrhage from the dura and the bone was quite free. A small drain-tube was inserted, the flap was replaced and stitched with catgut, and the wound was dressed with iodoform. The operation consumed about an hour and a half. The patient bore the chloroform well, and recovered from it without any nausea or other ill effects. The dressing was not changed until the fourth day, when the wound was found perfectly united, except at the point where the tube emerged.

There had been slight oozing of serum, but no pus had formed. The tube was removed and the dressing changed. At no time was there any acceleration of pulse or rise of temperature. On the seventh day the patient was allowed to dress and walk about the wards and a week later was discharged as cured. At this date, eight weeks after the operation, he has had no pain nor any symptom of an epileptic seizure.

J. S., æt. 13, was kicked on the head by a horse. After lying in a comatose condition for a number of days he was brought under the writer's care.

The objective examination upon the operating table confirmed the diagnosis of a depressed fracture of the skull, and made it evident that trephining was not only justifiable but urgently necessary. The surface temperature taken over the seat of injury, just previous to the operation, was 99.5 degrees Fahrenheit. The surface thermometer used was Seguin's, manufactured by Tiemann. After shaving that portion of the scalp over the depressed area and cleansing thoroughly with bichloride solution (1-2000) a free incision was made down through the soft parts and periosteum. The latter was carefully loosened and reflected, and a one-inch trephine applied to the solid bone. From this point the elevator was used in removing the fragments. At the point of most complete fracture a collection of pus was found. Thirteen fragments were removed. The bones were crushed into small pieces, the largest of which was not much more than an inch in length. and from that down to ¼-inch. Some of the pointed pieces had penetrated the dura mater and lay embedded in the brain, while two teaspoonfuls of pus and brain matter oozed out—the larger portion, probably one and a half teaspoonful, being brain matter.

Treatment consisted in removing all the fragments of bone which might afterward become necrossed and cause trouble, and in rasping the edges of the remaining bone. After removing every particle of foreign matter, the wound was irrigated with a solution of mercuric bichloride (1-3000). Iodoform was dusted over it, the flaps replaced and held by a wet roller.

The boy was removed to his bed and rallied well from the operation. He took nourishment freely, and fortunately manifested no bad symptoms from the anæsthetic employed (chloroform). The evening temperature was 100 degrees Fahrenheit, and the next morning 99 degrees. Leiter's cold water coil was applied to the head for the five days succeeding the operation, but there was no inflammatory reaction. The bromides of sodium and lithium were administered to diminish blood pressure and produce sleep. On the fifth day local symptoms of an accumulation of pus were noticed, and one of the flaps was loosened from its attachments and the pus evacuated. A hernia cerebri developed on the sixth day, and its general outline, though poorly shown, can be seen in Fig. 2. Pressure was made for several days by means of a piece of gutta percha about three inches square, which was placed directly over the hernia and held in place by a roller. Under this treatment the hernia gradually disappeared.

The fragments of bone removed were thirteen in number, and gave an area of about 3½ square inches. The appended figure No. 2 shows the general outline of bone and shape of the fragments.

The necessity for antiseptic treatment, judging from the progress of this case, seems to be especially important in brain surgery. In this particular instance it seems very probable that the risks were diminished and success made more certain by its employment. The wound was always dressed under the carbolic spray, and iodoform was used freely.

He has suffered in no way from the injury, being bright and active as he was before it was received. This boy recovered perfectly from the effects of his injury and regained his former strength and intelligence. The wound closed with a firm, tough covering, but several months after the irregular outline of the wound could be felt.

The line of treatment of injuries of the brain and its membranes is a comprehensive one. We are liable to find as the result of an injury:

(a) An extravasation of blood between the dura mater and bone.
(b) Into the cavity of arachnoid.
(c) On the surface of the brain between it and the arachnoid.
(d) Into the substance of the brain or into the ventricles.

In such cases the clot will be found to have no tendency to absorption or encystment. It may vary greatly in size. The symptoms are usually those of compression or irritation. An interval of consciousness followed by symptoms of compression may be considered almost positively diagnostic.

As to the treatment there can be no question as to the propriety of trephining for intra-cranial traumatic hemorrhage. The operation is not only imperatively demanded but is promising of the best results. The clot should be turned out, proper drainage established and the wound antiseptically dressed.

Any injury to the head is liable to produce encephalitis of an acute character. So slight an injury as an incised wound of the scalp may excite an osteitis, meningitis and finally cerebritis. The signs of an acute cerebritis are an acute pain in the head, an acute sensitiveness to light and sound, both or only one pupil contracted, convulsions, a rise in temperature, vomiting and delirium. Coma may ensue and death result from exhaustion or compression.

If the symptoms cannot be relieved by local applications of cold, leeches, cathartics and sedatives, together with absolute rest, the case will usually lapse into one of intra-cranial suppuration. When symptoms of compression appear, together with rise in temperature and rigors, the only resort is the trephine, and in its use I am always guided by the principles previously defined.

Hernia cerebri is a common result of wounds and operations. I have never failed to reduce and remove the condition by the employment of pressure made by means of a gutta percha or metallic disk. This also should be applied under proper antiseptic precautions.

I do not know whether it comes within the province of this paper to mention compression and concussion—two terms that indicate a peculiar and important assemblage of symptoms, but I cannot refrain from calling attention to their differential diagnosis. Concussion is simply a "stunning." Compression implies stupor and partial or complete paralysis. The term compression implies pressure such as would be caused by extravasated blood, inflammatory thickening or œdema, while concussion would seem to indicate a tearing or laceration of the brain. The symptoms as contrasted would suggest the following points:

COMPRESSION.	CONCUSSION.
1. Total insensibility.	1. Insensibility from which the patient can be partly aroused.
2. Respiration stertorous and puffing.	2. Respiration feeble.
3. Pulse slow, full and labored.	3. Pulse weak and irregular.
4. Special senses paralyzed.	4. Special sense dulled.
5. Pupils dilated or one dilated and the other contracted.	5. Pupils variable. Sensative to light.
6 · Stomach inactive.	6. Nausea.
Sphincters may be paralyzed.	Bowels relaxed. Sphincters not paralyzed.
Bowels torpid.	Bladder can expel water.
Bladder paralyzed. Retention.	Comes instantaneously and passes off gradually.
Appears gradually and grows worse.	

For the alleviation of the symptoms of both conditions efforts must be made to overcome shock. To accomplish this hot bottles, blankets and friction are advisable at first, and after reaction has taken place to avoid hemorrhage and inflammation. Always be prepared to combat the symptoms of compression, no matter from what cause, by the prompt employment of such measures as dark room, elevated head, shaven head, cold, low diet and free action of bowels. Again I would advise the employment of the trephine for all cases presenting symptoms of compression. There is no good reason why blood or pus in the substance of membranes of the brain should not be evacuated and given free exit. If once the diagnosis be made, incision and trephining are as imperatively demanded as it would be in any other part of the body.

Allow me to repeat my former statement, that under the proper antiseptic precautions the operations upon the calvarium and its contents are less liable to be followed by unpleasant results than operations upon any other organ or tissue. The surgeon who has had a long and trying fight with a case of phlegmonous inflammation in the tissues of the arm and hand would hail with delight a case of trephining for hemorrhage or abscess. As to the injury of cranial nerves from fractures of the bones of the skull little need be said. Usually the prognosis is bad. However there must be borne in mind the possibility of syphilitic osteitis of the cranium as well as traumatic osteitis. So-called inflammation of the diploe from traumatic causes implies the possibility of caries and necrosis with consequent absorption of septic material and septicæmic symptoms, and extension to the membranes of the brain.

In conclusion, I would say, let antisepsis be employed first, last and all the time. Free incision and drainage next, and last but not too late the use of the trephine and saw. Do not wait until too late, but in all cases of fracture of the skull attended by depression however slight use the trephine. Cases of traumatic epilepsy should be subjected to the trephine—the earlier the better. For intra-cranial hemorrhage, failure to use the trephine is almost inexcusable—trephining under antiseptic precautions being a practically safe operation. The earlier done, the more promising of good results—and all results of treatment so pursued are sufficiently good to encourage the surgeon to follow this line of treatment.

Cranial Injuries, with a Report of a Case.

[By Surgeon Joshua Chitwood, M. D., Connersville, Ind.]

The extent to which the skull can be depressed without fracturing its bony composition is a question of no little importance to the surgeon. We are informed by authority that a matured cranium is rarely capable of a change in its calibre by force, without being subject to a solution of continuity of one or more of the bones that form it. And on the first view of of the subject we admit that we are not inclined to doubt the correctness of the assertion, but when we consider our surgical experience and pass in review more than a score of years of active surgical life, in which we have learned some lessons that have been inculcated by a teacher that is acknowledged to be more reliable than theory, although sometimes expensive, we are led to question the above assertion.

We are prepared to venture the opinion that frequent depression without fracture takes place. In the study of craniums we have observed the striking and well marked difference in the bone textures, as well as the thickness of the ossific structures. The bones of the skull range in thickness from the thinnest and most fragile organization to those of solidity and diameters that are calculated to resist the most extreme power that is liable to be applied to them. As an example of the latter variety, many students of the Ohio Medical college will remember the skull of the African that is in the museum of that institution, that measures the almost incredible thickness of 4½ inches through the occipital, and the balance of the cranial bones in proportion.

We all have noticed quite a variance in the structures especially of the parietal and temporal bones. In a case of fracture of one of those bones which I was called to attend a short time since, in which the patient suffered a punctured fracture, I found the thickness of the plates not to exceed the thickness of the shell of a goose egg, and the diploatic space was preternaturally thick.

Now, in cases where the bones are thin, and are also deficient in earthy matter, having a superabundance of animal constituents, it is quite evident that as a matured cranium thus approaches the peculiarity of early formation of these important conditions, the probabilities of compression of the brain by the yielding alone by their elasticity, without fracture from an evenly applied force, are not only plausible, but certainly within the range of possibility and are at least occasionally met with in surgical practice. The bones in such cases may sustain permanent deformity or they may, after the force is removed, return to their former shape and not be followed with any of the abnormal links in the chain of fracture phenomena.

I purpose in this paper to report two cases which illustrate each of those injuries without fracture, one in which indentation of both parietal bones was permanent, the other in which the bones returned to their original shape, immediately after the injury.

Case 1. From the note book of my father, Dr. G. R. Chitwood of Connersville, Ind., dated 1855.—Was called to see a young man seventeen years old, who accidentally got his head caught in the carriage of his father's saw mill, and before he could extricate it was pushed rapidly through a space that was exactly one inch less in diameter than his head. When the mill was stopped in response to the screams of the sufferer and the force was removed, the patient fell to the floor a distance of two feet and was picked up in an unconcious condition.

Before my father's arrival, which was two hours after the accident, the patient had regained consciousness and was weeping over severe pain in the head, neck and chest; blood issued from his right ear, eyes and nose. Sedatives were prescribed, and hot water was applied to the head by means of large compresses. My father visited him on the following day, and found him resting comfortably. A groove was plainly discernible along each parietal bone, and a depression one-half inch deep remained permanently. He never suffered with abnormal brain symptoms afterwards.

Case 2. Taken from my note book.—Was hurriedly summoned to visit conductor Tingley, of the C. H. & I. R. R., who was reported to have suffered a fatal injury by having his head caught between the bumpers of the two rear cars of his train. On my arrival at the station I found him lying on a bench in the waiting room where he had been carried. He exhibited a very peculiar appearance; both eyes were closed by extravasation in the soft tissues surrounding them. Blood was flowing from his ears, eyes and nose, the pulse was slow and irregular, his breathing was labored and stertorous, both pupils were dilated and he was in deep coma. I directed his removal on a stretcher to his residence, a distance of one block from the station. Soon after his arrival he vomited freely, ejecting blood and partially digested food, whereupon he rallied and passed rapidly from the comatose condition to full consciousness. He complained bitterly of severe pain in back, head and chest. Large cloths saturated in hot water were applied to his head and spine, bro. pot. and chloral hydrate were administered internally and it was necessary to catheterise him morning and evening for three or four days, after which he made a good recovery and reported for duty to the company thirty days after the accident. The space occupied by the head between the bumpers was carefully measured and found to be 6 inches, and his head measured 6½ inches in diameter.

Examination failed to detect the slightest deformity of any of the bones of the head. They had evidently been "sprung in" upon the brain by means of the immense force that was exercised upon them and after the removal of the pressure they had returned to their normal position not unlike the ossific surroundings of the infantile head under like circumstances, and with no fracture in any degree, either of the external or internal plates. In both of the above cases it is plain to my mind that no operative procedure would have been advisable nor could it have resulted in any manner to the benefit of the patient, but most probably to his detriment. In the case of infantile compression referred to in Grose's Surgery, the result of injuries received to the head by falling down a stairway, the author infers that the return to consciousness of his little patient precluded the necessity of following the general rules in surgery of cutting down upon the supposed fracture for the purpose of elevating the depressed bone or relieving the sufferer with the trephine.

In such cases no doubt the coma might be relieved before the operation was fairly commenced, as was the case operated on and recited in the novel entitled the "Arkansas Doctor," the poor negro calling out in lamentable tones: "O, master, quit hurting me," during the first few rounds of the trephine. As physicians we should learn a lesson from every case we examine and prescribe for, and every case that the surgeon endeavors to lead to the physiological line by means of his art should teach him a lesson, should inculcate at least one idea of advance, investigation and research. My cases as reported above are not without a lesson to me, and I have been profited by them in many cases of cranial injuries since in my practice of surgery. They whispered in my ear the word "conservatism," and I fully believe we might all profit in head injuries that come under our notice, especially where the diagnosis of fracture is not readily made, and if not sufficiently clear to be beyond all doubt, by patiently waiting for a season after the infliction of the injury before resorting to surgical means which might result in aggravating instead of improving the patient's condition. I do not wish to be understood to refer to those cases of compound or compound comminuted fractures that speak so plainly to the surgeon that no reasonable doubt can exist as to their nature as well as treatment, but I allude to those cases of depression of the skull without fracture, when all phenomena of compression are present, produced by the bones being bent rather than broken.

I am well aware that the profession is divided as to the proper procedure in all cases of depression whether with fracture or without it. I admit that in the light that I now see the subject of a depression unaccompanied by fracture I believe the conservative course is the best, and in event of epilepsy or other nervous conditions demanding the trephine later in the history of the case, then is the proper time to resort to the operation, in conformity to the fundamental principles of surgery as well as medicine to cure the patient by removing the cause.

DISCUSSION ON DR. CHITWOOD'S PAPER.

Dr. George A. Baxter, Chattanooga—I want to thank the doctor personally for his paper, because it does not conflict with authority and because it is true. In my own experience I have come to the conclusion very slowly, and I must say more slowly than I should have done on account of the weight of authority which says trephine in cases of depressed fracture of the skull. I have recently had the subject brought prominently before me. I desire to report two cases in regard to this subject, one conforming directly with the doctor's paper of depressed fracture of the skull, received in an elevator, where I could lay my thumb deliberately in it over the parietal bone with not one single symptom other than a little temporary excitement. There was not even a depression of the pulse, which was 72, and not one single symptom except a little headache following it on the same day of the injury. To-day, a month and a half from the receipt of the injury, the patient is able to do his work without any complaint whatever.

The second case takes me beyond the assertion of depressed bone without fracture. The case I am about to relate was one in which a depressed fracture was received by the patient falling from a four-story building during the process of lifting. The sharp corner of the brick struck at the junction of the two parietal and frontal bones. There was a depression perhaps of three-eighths of an inch with severe concussion. The pulse was depressed; there was vomiting, and a desire to operate on the part of some surgeons. The patient gradually recovered from this in four days, with a normal pulse. The headache which existed was afterwards relieved. One or two surgeons insisted upon an operation being performed; they said the injury must of necessity exist and must be doing harm. Whenever such an injury is not endangering the life of the individual or his usefulness, until symptoms exist, no man is, in my opinion, justified in boring through the bony substance into the brain tissue.

Dr. E. Griswold, Sharon, Pa.—We are in danger of running in a wrong direction with conservative teaching in my opinion. I have had a large experience in brain surgery, not only in the army but in private practice. The cases recited by Dr. Chitwood came out very well. They were undoubtedly exceptional cases. They were not cases of injury from fracture of the skull, but cases I should say of injury from concussion of the brain from which patients recover, the normal supply of blood being carried to the brain in a short time. Take a fracture of the skull without symptoms; if there is depression we ought to trephine. It is a simple operation and is harmless if done carefully. Nearly every patient will recover, as there is comparatively little danger attached to such an operation. Very few cases of three-eighths of an inch depression will escape some ulterior consequences that will remain as long as the patient lives. Twenty years ago I remember being called in consultation to see a little boy who had been struck across the parietal bone about an inch thick. The scalp was a little swollen, there was a little intumescence, but it was not broken. There was no abrasion and it did not seem as though there should be any fracture. I advised some treatment and left the patient for three or four days, when I was called again. The patient did not show any bad symptoms, except a slight reaction of the pupils. There was no sign of paralysis, no vomiting, and the patient could eat; still I was not satisfied, and therefore advised an exploratory incision. I made a crucial incision over the part where the injury had been sustained and found a depressed fracture. The skin was not broken and the skull was depressed to the extent of nearly one-quarter of an inch. At that time I was in the habit of trying to save pieces of bone. I took out two or three good-sized pieces, elevated the rest, the boy got well and has been so ever since If that had not been done, what would have been his condition at this time? He would have been an epileptic all these years.

Dr. J. W. Young, Broomfield, Iowa—I had a case come under my care the 15th of last October. It was a young man, twenty-two years old, who had been kicked on the side of the head by a horse, making no external wound. I was called to see the case the following morning. Two surgeons had been in attendance over night. We had nothing to elevate the skull with. It seemed depressed about one-quarter of an inch. The patient lay in a collapsed condition all night. I had to go about 15 miles distant and got there 8 o'clock in the morning. Half an hour after I arrived he returned to consciousness, was able to sit up in bed and had a slight headache. I said the bone ought to be elevated by all means. The other surgeons were in favor of elevating the depressed portions, but the wife said we should not do it. We came away and left some simple instructions for the patient to carry out.

He got up and went about his business. Some two months thereafter he began to show signs of derangement occasionally. He forgot what he ought to do in his business. He was a farmer by occupation. He wandered about the streets aimlessly and finally got angry with a man without cause and armed himself with a shotgun. Two weeks ago he was sent to the Iowa hospital for the insane. This case illustrates the wisdom of trephining and elevating portions of depressed bone in cases of fracture of the skull.

Dr. E. S. Lanphear, Kansas City, Mo.—I enter a solemn protest against the so called conservative treatment of injuries of the head. There is no injury that is so important to the railway surgeon as an injury involving the bone of the cranium. There is no injnry that is so poorly treated as a rule.

In regard to the assertion of the essayist that injuries which will perhaps result in epilepsy eventually should be left until the epileptic symptoms make their appearance, I do not believe it to be based upon rational surgery, and I would cite the assertion of the late professor Agnew in the last paper which he prepared, in which he stated not only in ordinary print, but in italics, that every case of injury of the head which would eventually terminate in an epilepsy should be operated upon directly after the reception of the injury, if possible; because experience has taught those who have operated for traumatic epilepsy that very few cases terminate favorably if left until after the epileptic manifestations have appeared; whereas injuries which would necessarily result because of the injury to the motor area in epilepsy if operated on at the time of the accident, or directly thereafter, may be prevented in a large proportion of cases.

Again, we go too far in letting our patients alone when they are unconscious. From an experience of over 40 cases of brain surgery, I have learned that every case of injury to the head in which the comatose condition persists for more than two or three hours demands imperatively that the surgeon should go in and ascertain what the injury is. If he enters the cranium with clean hands and clean instruments there is absolutely no danger to be feared from his operative interference; whereas if he does not investigate the case he may find too late that he has had rupture of the middle meningeal artery with the formation of a clot which will produce death, or at least very serious symptoms for which the company he represents will be liable. I therefore repeat that we can carry conservative treatment entirely too far. I for one enter a hearty plea for more invasion of the cranial cavity and less conservatism in those cases accompanied by coma. [Applause,]

Dr. W. A. Phillips, Salina, Kansas—Mr. President, I inferred from the essayist that he was describing the condition actually present of compression or change in relation to the bone surfaces of the skull without fracture. While this hypothesis is very entertaining and certainly would be valuable if sustained, it seems to me the author has refused to sustain the position he was intending to prove, that it was possible to compress or change the relations of the bony structures without fracture. It seems to me the symptomatology here recited tends to show that there was a basic fracture at least. In the first case an autopsy was made which has given us no results, and we can not say there was no fracture. In the second case no opportunity was given for an autopsy. It seems to me the symptomatology presented would indicate there was fracture. One or two gentlemen have advocated direct interference in brain surgery. This association should I think take a middle ground in regard to surgical interference, as cited by the authors of old, which is the safe one. I do not mean to say that we have not accomplished a great deal in cerebral surgery. Under antiseptic precautions most excellent results have been obtained in doubtful cases. This does not give permission to put any human life in jeopardy when it can be avoided in order to entail upon a railroad company great expense for a poorly done operation. Good judgment is requisite in all cases. We will find in some cases that operative interference is not demanded. I might refer to two or three cases that came under my observation in which the position of non-interference was certainly a good one as demonstrated by satisfactory results. I wish to call attention to the simple fact that a few hours waiting may not do any damage. Symptoms present themselves by waiting, indicating time for operation, and I do not think any surgeon would interfere unless he saw reason for it. When we find a disturbed pupil, a comatose condition continued for a long time, when we have the classical straw-colored fluid from the ear, together with other symptoms, it is time to resort to surgical interference, and until then no sane man would operate. It would not be wise surgery to do so. I do think that human life should not be put in jeopardy and railroad interests jeopardized by too anxious operators in the cerebral field.

Dr. J. B. Murdoch, Pittsburgh, Pa.—The statement of the last speaker is one I think we all concur in, viz., that human life should not be put in jeopardy. We may differ, though, as to how human life is put in jeopardy. A man receives a blow on the head which produces a depressed fracture of the skull; the moment that happens human life is in jeopardy, and to withhold a hand that would elevate that bone and relieve the pressure from the brain is to leave the man in a condition of jeopardy. You do not put him in jeopardy by putting forth a hand to relieve the depression. The time has passed when we can withhold such relief. There is one rule in surgery which existed long before Lister made the treatment of wounds so safe, and that was in one form of injury to the skull—punctured fracture; trephining should be resorted to at once in such a case, and because of the fact that in any case of fracture when a knife or sharp instrument is driven through the brain no one can tell how much the internal table of the skull may be injured, and although there may be no injury to the external table the internal may be driven down into the brain, and without trephining the skull it is impossible to ascertain that fact. Now, I contend with the gentleman from Kansas City that the operation of trephining under aseptic precautions is one entirely devoid of danger, and when we find that there is a depression of the skull in an injury with or without brain symptoms, if there is depression of the skull, that skull should be elevated, not because the man may recover in a day or two and go about his business, but because he has a condition of things that may at any moment result in an epileptic fit; and when the epileptic habit is confirmed, operations are useless in a great many cases, not always. How often has the conservative surgeon seen cases coming to him seven years after the receipt of the injury; with epileptic paroxysms, when a depression is found in the skull, the patient perhaps being kicked by a horse six or seven years ago. In this enlightened age the surgeon who would allow such depression to exist would be derelict in his duty. Whether the fracture be a simple or compound one we are justified in a case of depressed bone in cutting through the scalp to examine the skull and elevate the depression.

I want to say one word in regard to the paper. I think it is a very interesting and instructive one and trust it will aprear in our volume of transactions. The fact that bones will bend without breaking is one that has long been known to surgeons, not only bones of the head but those elsewhere. We have the green stick fracture of the child without breaking of the bone; we have a depressed skull without distinct fracture in the young subject, and that the skull can be depressed in a smaller diameter than it holds is a fact which I know from a case of my own. About five years ago I was called to see a patient over whom an engine had run, and the fire-box was measured from its lowest position down to the tie. He was about 14 years old. It went over his head and body, producing a dislocation of the knee which was the only interesting point in the treatment except the distance between the fire-box and tie was one inch less than the diameter of the boy's skull. The boy did not suffer very much from cerebral trouble. The elasticity of the bones led to compression without any injury to the skull.

I do not look upon the operation of trephining as open to any particula danger. During the last three years I have trephined seven patients for epilepsy and relieved two of them. When the operation is done with clean hands it is not much more dangerous than to make a wound through the skin. I do not think we put the patient's life in jeoparey at all when we trephine a patient. We do put it in jeopardy if we permit that depression to exist, withhold our hands and not give the relief which it is our duty to do.

Dr. M. T. Williams, Mt. Carmel, Pa.—The discussion has taken such an interesting turn that perhaps if I relate a case that came under my observation recently it might prove of interest to the association.

The accident occured at a fire some time ago. The firemen in some manner hit the patient on the head with the nozzle of their hose and directly after the accident occured I was called to see him. I found him bleeding profusely from an incised wound on the head. There were no symptoms of fracture. I stitched up the wound and dressed it antiseptically, thinking I would have a simply case. In about a week union took place. The second week the patient walked to my office. He had a very dull, apathetic appearance, and I commenced to think that perhaps he might have sustained some injury to his brain, and I told him I would call to see him in a couple days at his house. When I got there he came down stairs and I noticed he had a dull appearance, that he could scarely raise his hand and had no feeligg of any kind in one side of his hand. So I came to the conclusion that the right thing to do was to operate. I advized his brothers, young men, what I considered best to do, and they consented to an operation, which I performed in the afternoon. I did not use any anæsthetic, simply used injections of cocaine in and around the tissues, making the incision over the seat of injury and removing enough of the scalp to take out a piece of the bone. After the bone was removed I noticed that the dura mater projected slightly through the opening made. It occured to me it would be prudent to incise that. I therefore made an opening in the dura mater and much to my surprise a teaspoonful of pus came out. After that was done I cleaned out the wound thoroughly, put in worm gut suture, stitched up the dura mater carefully, then closed the wound, put in a drainage tube, and I am happy to say the patient got along nicely.

I am imbued with the idea of conservatism, and with that idea I took it for granted he would get along nicely, and I think in view of the experience that case gave me it would have been better if I had operated and made a more extensive examination at the time the injury was received and not waited until ten or twelve days afterward. Had I waited a few days longer my patient would have had convulsions and would have died. I consider the operation timely in this case.

Dr. Milton Jay, Chicago, Ill.—I think there are two points to be considered in connection with this subject. It is well known to the operative surgeon that we have fracture of the skull without any depression or injury to the brain, and there are many brain injuries where there are effusion and compression with coma without any fracture. Now, the surgeon that undertakes to trephine either case that has the appearance of a fractured skull will do no more than he ought to do. Every one that refuses to trephine because he finds no fracture of the skull will be derelict in his duty. I have seen fracture of the external table of the skull, but the internal table was not fractured.

I have seen cases in which there was no fracture externally, but where there had been effusion internally. Now then, the thing to do is for every surgeon to take the symptoms. If there is a fracture with unmistakable pressure on the brain, no time should be lost in elevating the fractured bone. If there is coma, dilated pupils, and all the symptoms that make it unmistakable, when there is effusion with compression of the brain, we should trephine whether we have depression or not.

Dr. W. B. Outten, St. Louis, Mo.—I rather think that the gentlemen who are in favor of trephining, who have expressed themselves in consequence of a desire to get at the proper condition, have probably misled a good many of the gentlemen as to the procedure of the operation. I maintain it certainly good sense that in the event you have a fracture, it is immaterial whether externally or internally, there are mechanical elements by which you can cut down and examine the condition and extent of the fracture without doing one iota of harm. We may have fracture of the external table without any symptons which we see of pressure. Now then, there is no doubt the probable effects of pressure might come on. Suppose I take a chisel and mallet and work my way down upon the brain, and find the injury extends to the internal table, I have done a portion of my duty, and under antiseptic precautions it certainly seems to me that there is relatively no danger. I think by trying the various appliances, not by trephining alone, to those cases which adapt themselves to the best mechanical execution, we can do no harm.

Dr. S. S. Thorn, Toledo, O.—I want to emphasize the necessity of absolute diagnosis. I am one of those gentlemen who believe there can be no possible harm following the trephine. I do not think it is a more serious operation than to remove one of the phalanges, but I do believe that we should pay more attention to diagnosis. I believe that nine out of ten cases are the result of chronic irritation or trauma. I will go further than that and say that I do not believe in idiopathic epilepsy. If such a condition does not obtain as idiopathic epilepsy, then we must have epilepsy the result of trauma either of to-day or some remote period; therefore take your chisel and follow out the suggestions that have been made and you have done no possible harm. You might have established your diagnosis, which is an important consideration, and one which I rise to emphasize in connection with the paper and the class of cases under discussion.

Dr. Joshua Chitwood, Connersville, Ind.—The discussion that has been elicited on my short paper has been very satisfactory to me, and I am glad it was worthy of such discussion and opinions as have been given. But it seems to me most of the members of the association misunderstand the exact statements in the paper. I referred to those cases that were unmistakably fractures and that were easily diagnosed by all the standing symptoms of fracture. There could be no harm in using an instrument in extending the wound and trephining or elevating the fractured portions. It was in cases of bent fractures or bending bone that I referred to in which there were no symptoms following shortly after the injury, nor afterwards. My cases did not develop epilepsv or any other nervous phenomena. These cases have been important to me. I have had a number of them. I might have reported them while in the volunteer service of my country as surgeon of the Seventh Indiana Cavalry.

Cranial Injuries—Report of Two Cases.

[By W. A. Ward, M. D., Surgeon N. Y. C. & S. L. R. R., Conneaut, Ohio.]

In connection with the subject of cranial injuries it is not my purpose to enter into a dissertation of its various phenomena or phases, but to outline the history of two cases coming under my care, clearly demonstrating the truism of the expression; "There is no injury of the head too light to trifle with, or too severe to despair of;" one deemed by the injured not to require more than a passing notice and neglected, with most serious results; the other, one in which for a time life appeared as if hung in a balance, terminating happily.

Case 1. C. W. D., aged 30, American, married, car repairer, came into my office, July 18, 1888, and remarked that he "had a bunch on the top of his head, which had been there long enough, and wished to get rid of it," and gave following history: One day in latter part of March last, while at work under a car, received warning to get out as an engine was bearing down; in hurry bumped his head against the end of a projecting bolt. Pain pretty severe for a short time; applied cold water and kept to work. A bunch immediately formed, but suffering no trouble had let it go in hopes it would pass off itself; in fact no symptoms that could be attributed to injury except inconveniences from presence of tumor.

On examination found a firm hard tumor over superior middle portion of right parietal, overlapping sagittal suture, some two inches in transverse and two and one-half inches in antero-posterior diameter, of variable thickness, thinnest at edges, immovable, no soreness or tenderness, yet firm pressure produced a shooting pain, darting down in front of ear. General condition good, no history of cancer in family; diagnosis, hæmatoma (organized). Advised its removal, but patient declining, prescribed some discutient remedies and requested him to call again a few days.

Did not see him again until Aug. 9, when he thought he was doing very well and tumor decreasing. For a few days after first call had some pain in that part of head, very little of late, but a disagreeable sensation at times.

No cerebral disturbances, feels weak, with aching in limbs, etc.; quit yards, thinking work too hard for him. Examination—tumor edges hard and firm, center doughy and semi-fluctuating; no appreciable difference in size.

From this on tumor gradually increased, although slowly, without other symptoms, and in the fore part of November, after consulting with Dr. F. J. Weed of Cleveland, patient consented, and on the 15th of that month, assisted by Drs. Fifield and Merriam, I removed it under antiseptic precautions. The bone in center of field presented undoubted evidences of fracture of outer table, at which point tumor was adherent, but—no particular depression, callus good, absence of symptoms indicative of cerebral mischief, and friends not freely consenting—farther interference was not undertaken, the wound closed and dressed antiseptically, which healed mostly by first intention, and attendance was discontinued early in December.

I heard nothing farther from the case until the fall following, 1889 (notes lost), when he again reported at office with information that tumor had returned. Found it larger than the original and, as he stated, growing rapidly, a general malaise, with headache, vertigo, absent-minded, loss of memory, etc. Watched the case closely for several months, a portion of time patient confined either to bed or house, (rheumatism, from which he had formerly more or less suffered, being a factor), the tumor enlarging, cerebral mischief increasing, with mental degeneration quite prominent. Repeatedly assured patient and friends that trephining afforded the only hope of relief, acquiescence was slow but finally accorded, and the latter part of March, 1890, accompanied him to Cleveland and left him at University hospital for that purpose, in charge of Dr. F. J. Weed, who after a few days' observation confirmed my opinion and advice. The patient and wife were fully informed of the pros and cons, and accepted operation. Accordingly on or about the 12th of April. the scalp being prepared the day before, the external tumor was first extirpated, then trephine applied and button of bone removed, disclosing an inter-cranial tumor similar to external. For further exploration and in hopes of outlining tumor and its removal, the opening was enlarged by aid of saw and chisel, but finally abandoned and wound dressed; all this under strict aseptis. Operation was very well borne, yet there was a gradual but persistent decline, and the patient died April 27, about two years and one month after receipt of injury.

Dr. Brokaw, house surgeon, kindly furnished me the following note of the post mortem:

MEDICAL DEPARTMENT, UNIVERSITY OF WOOSTER,
CLEVELAND, OHIO, May 7, 1890.

W. A. Ward, M. D., Conneaut, Ohio—DEAR SIR: I submit below notes of the post mortem of C. W. D., April 28, 1899:

Pericranium preternaturally loose. Skull very rough and nodular for a distance of about three inches around the point of trephining on inner surface. Diploe infiltrated and skull much thickened. Dura mater very much thickened on right side and adherent, especially over middle right hemisphere. Brain under point of trephining over right hemisphere exhibited a hardened nodular mass or growth, underneath which was a cavity filled with broken down brain tissue. This growth was closely adherent to and removed with the dura mater.

The above I believe covers the points of interest in the case, but any further information you may desire will be cheerfully furnished. With best wishes, we are

Yours sincerely,
W. F. BROKAW.

Case 2. Dec. 4, 1891, about 6;30 p. m., was called to station to attend D. C. J., brakeman, single, American. Found patient lying upon a cushion on floor, face and head covered with blood, wild and delirious; feeble pulse, cold extremities, etc. On washing found blood came from left ear and flowing quite freely. Immediately had him conveyed to boarding house for proper care. Shortly vomited blood freely. A more careful examination revealed abrasion of nose, contusion of forehead, left mastoid and parts contiguous and left posterior pelvic region. Delirium gradually lessened and at midnight a comatose condition had superseded. Careful inquiry failed to elicit any information further than that he was picked up beside track at Wallace Junction (some sixteen miles distant) and brought in on a freight. Afterwards was informed that he was knocked from side of a box car caboose while ascending ladder, by a car on side track not fully "in the clear."

On the 5th bowels responded freely and slight evidence of returning consciousness; mind remained cloudy for several days; 9th recalled incidents prior to accident, but nothing relative thereto, and on the 12th expression quite clear. Blood continued to ooze from the ear, gradually diminishing and finally superseded by discharge of cerebro-spinal fluid, the latter marked, on the 8th and 12th almost wholly, although blood stains were frequently observed afterwards. On the 7th paralysis of the seventh nerve was evident and on the morning of the 8th was summoned quite early, the nurse becoming alarmed thereat.

Headache was quite a factor for the first two weeks, at times severe. Temperature highest on the 8th and 9th, registering on those days 99 degrees. Pulse continued variable, 64 to 72. Seizures of vertigo quite frequent for two months or more, especially on quick movement of head, and a jar evinced evidence of soreness. Catheter at no time required and bowels usually responded properly to cathartics.

The case progressed favorably from first to last, with very few untoward symptoms, and the man resumed work in the fore part of April, 1892, under partial protest. He continues to improve, and when seen a few days ago remarked that he did not know but that he felt as well as ever. Paralysis yet evident but improving.

The case was closely watched, the most of the first month two or three visits per day, afterward less often, remaining under surveillance some four months, latterly calling at office as convenient. As to treatment it was expectant, meeting indications as they arose from day to day. Bromides and ice caps for headache, laxatives, low diet, rest, etc. The ear syringed with a solution of hydrarg. chlo. cor. sufficiently often to keep aseptic and insufflated with boracic acid until healed, some three months.

The three cardinal symptoms of fracture of the middle fossæ of the base, viz., hemorrhage and discharge of cerebro spinal fluid from the ear, and paralysis of the seventh nerve, were all present and each well marked, which together with contusions and other evidences of violence to the head makes the diagnosis as positive as well could be, short of a post mortem, which, fortunately, we cannot yet obtain. The result I attribute to the close care and attention given, and keeping nature untrammeled in her work of repair.

It may be said a sufficient period has not as yet elapsed to exclude the liability of secondary complications, and the question arises, what is to be this patient's future? Time alone can tell; certainly the present is most flattering. Possibly such a case as this, with its promised results, might be

With our present knowledge of the causes of wound infection and the uses of mechanical disinfectants we are enabled to secure the most general asepsis and to operate upon the spinal region with as little fear of sepsis as we would in the abdominal region.

But the conclusions of men of to-day, living opinions if you choose, will concern us most.

As long ago as 1870 Brown-Sequard came to the conclusion that exposing the cord was not dangerous, that death after fracture was usually the result of pressure with continued irritation of the cord by fragments of bone and not the result of partial or complete destruction, and that reunion could take place after laceration of the cord. Dawburn, Burrell, Dandridge, Lloyd and others have in the main come to conclusions more or less favorable to the operation.

White thinks operative interference should be employed (1) in all cases in which depression of the arches is obvious; (2) in some cases of fracture in which rapidly progressive degenerative changes are manifested; (3) in all cases of compression of the canda equina; (4) in the presence of characteristic symptoms of spinal hemorrhage, intra or extradural; and in cases of such severe injury as would likely cause destruction of the cord, he follows Lauenstein's rule, viz., if after six to ten weeks there is incontinence of urine with cystitis, or incontinence of feces, and especially if attended with bed sores, but little can be hoped for from the unaided efforts of nature.

In a letter received from Dr. Ashhurst about a montn since, he says: "The only cases of fracture of the spine in which operative interference seems to me at all justifiable are the rare cases in which injury appears to have been caused by direct violence, the lesion being confined to the laminæ and processes and the cord apparently suffering from external compression only. In cases caused by indirect violence the injury to the cord is usually irreparable, only five out of 112 recorded cases having recovered."

Pilcher and Moullin advance practically the same views. Thorburn concludes in terms which, in the light of our present clinical data, I do not think many of us would accept. He says: "The operation of trephining the spine for traumatic lesions, as compared to the lesion it is intended to relieve, does not present any very great danger and appears unlikely to increase the gravity of the prognosis, but as both a priori argument and the results of published cases show that it is unlikely to be of service it should be abandoned except in cases of injury to the cauda equina."

Going to the other extreme we have no less an authority than Goldingbird stating that often from the obscurity of the history and the uncertainty of the results of examination, it becomes a matter of pure conjecture whether the paralytic symptoms are due to pressure of a broken arch or by blood clot or to division of the cord; and again, that the surgeon is surely justifiable, in every case, in urging upon the patient the propriety of an exploratory operation in the hopes of finding some relievable condition. He regards lamnectomy as a perfectly safe and recognized procedure.

Horsely advises operation at once "in all cases where displacement or crepitus indicates compression and where extension directly after the accident clearly fails to reduce the deformity," provided there are symptoms present which indicate interference with the functions of the cord;" and again, "so far from its being unjustifiable to operate on the spine owing to the possibility of the cord being hopelessly damaged, it seems to me to be criminal not to operate."

From the foregoing conclusions from some of the foremost surgeons and contributors to the literature of spinal surgery, do you wonder that we are undecided as to the advisability of operating or not; that we are lost in the chaos of the war of opinions? They are but opinions expressed from individual deductions, and what we want, what we need and must have is facts—physiological, pathological and therapeutical facts—sustained by reliable clinical data. That we may properly decide as to the advisability of operating in any given case it is first necessary that we be able to accurately diagnose the pathological condition from an anatomico-physiological standpoint. We should consider first the spinal column and the condition and relations of its component segments, and second, the condition of the spinal cord and its nerves.

To accurately diagnose a fracture or dislocation of the spine without exposing the patient to great danger is at times quite impossible. The simple though quite necessary act of turning the patient a little on the side may result in a laceration of the cord substance or even in instantaneous death, while the forcible manipulation of the parts in attempting to elicit crepitus or forcible rotation to determine the presence or absence of increased mobility might result as seriously. Examination and manipulatiou should therefore be as limited and gentle as the seriousness of the injury will permit, and local extravasation of blood, localized pain, increased on motion or pressure, and distinct deformity, with or without spinal cord symptoms, should constitute sufficient evidence upon which to base a diagnosis of probable fracture or displacement of the vertebræ. Simple fracture or simple dislocation of the vertebræ may occur, but the cases are rare. One usually complicates the other to some extent, and as the etiology, symptomatology and treatment are practically identical, we will consider them together throughout.

To appreciate the importance of spinal injury, and to be able to employ the operative measures intelligently necessitates a practical knowledge of the interlocked condition of the vertebræ, the relation of the cord to spinal canal in the different regions, the relations and attachments of the dura mater and the extent and location of the venous plexuses. When the cord is crushed or destroyed operative measures are as yet useless. Equally important is the fact that when the cord is only compressed, as by displaced bone or hemorrhage, operative measures afford great relief, and even when there has been partial destruction of its substance operative measures have in some cases so changed the local condition as to admit of repair.

Such being the case it is of special importance that our knowledge be such as to enable us to make an accurate diagnosis between complete destruction of the cord on the one hand and compressure with possibly only partial destruction on the other. When we are able to thus accurately diagnose the pathological condition then we may hope for greater unanimity as to the proper measures to be employed.

[As Dr. Manley will doubtless deal with the points of diagnosis and prognosis fully, I will but mention a few points in this connection.]

The first point to consider is the manner in which the injury was sustained, whether by direct or indirect violence. The effect of direct violence is variable from a simple fracture of the spinous process to that of the lamanæ with depression to a point of compression or possibly destruction of the cord, while in indirect violence the injury is usually very extensive.

The force necessary to produce fracture by excessive bending is necessarily very great and hence the greater tendency to marked displacement and destruction of the cord. That destruction is not always the case, even with marked dislocation, will be shown by one of the cases I have to report.

Thorburn has given as a sign which may at times aid us in differentiating as to greatness of the violence received, viz.: Extreme violence results in a destruction of the nerves at the point of the destruction of the cord, and would result in the anatomical correspondence of the area of anæsthesia, whereas with violence of a lesser degree the nerve roots would escape (even though the cord might be crushed), to which case the area of anæsthesia would be less than the anatomical correspondence.

Complete paraplegia and anæsthesia indicate the interruption of the conducting power of the cord by marked compression or destruction of its substance (or possibly, temporarily, as the result of contusion or concussion).

Partial anæsthesia and paresis are signs of incomplete interruption of the conducting power of the cord and nerve roots, the motor part always being more affected than the sensory.

Hyperæsthesia is a sign of irritation and is an indication of the cerebro-peripheral continuity of the sensory part of the cord above the point from which that particular peripheral nerve is given off.

Hyperæsthesia corresponding to the areas of distribution of the nerves having their exit at or just below the point of injury to the vertebræ, indicates pressure or irritation of the nerve trunk while hyperæsthesia below those areas indicates irritation of the cord and not destruction.

The diagnostic value of the reflexes in differentiating between total destruction and compression is as yet uncertain. Reflex action is of course lost in either case, in the area corresponding to the section destroyed or compressed.

Gowers informs us that "below a transverse lesion reflex action is commonly in excess, unless the centres are impaired by descending myelitis;" while

Starr says; "In crushed injuries the limbs are flaccid, the tendon reflexes absent and there is ankleclonus and rigidity."

Tillaux says that while exalted reflexes may indicate complete destruction of the cord in the cervical or dorsal region, as the cord would act more vigorously below the lesion, that total section in the lumbar region abolishes all reflexes, as there is no cord below the point of injury; and more recently Bowlby and Bastian have stated that the superficial reflexes may return, but "where there is a complete loss of deep reflexes there is probably a total transverse lesion, but when these reflexes are present the cord is certainly not completely crushed." If this be the case then we have quite a positive diagnostic sign in the reflexes, but as yet we must consider the value of the reflex as uncertain, except when the lesion is in the lumbar region, where even the neurologists, I think, would accept the conclusions of Tillaux.

The impossibility of always getting your patient into a position where the reflexes could be fairly tested without subjecting him to great danger is a point to consider relative to the value of this test.

This diversity of opinion, while stimulating to investigation, is certainly detrimental to the scientific standing of our profession, and as long as there are such radical differences as to the significance of a physiological reaction we cannot hope to come to any positive conclusions as to the condition of the cord without an operation, and as yet even that does not always furnish the desired information.

Fracture of the spine, while not causing any direct bony compression, may cause laceration of the plexuses of veins and result in an extradural hemorrhage, which would be quite a potent cause of compression. Clinical data furnished by Oldknow, Stephen Smith, G. W. Jones and Willet plainly show that the conclusion reached by Hutchinson and Clark was erroneous, and that extradural hemorrhage does not occur to the extent of causing compression, and that operative measures are indicated for its relief.

The cases which I have to report are those which have been under my personal care; one about four years ago and the others within the past fifteen months. The histories and remarks are not as complete as I would wish, but from the data at hand and the time at my disposal, I am unable to present them in a more complete form or to comment upon the instructive points more extensively.

Case 1. Fracture of the body and lamina of the seventh cervical vertebra, with penetrating wound of the lung—lamnectomy on the second day—death on the third day, from septic myelitis caused by infection from the lung:

J. W., negro, aged 43 years, coachman. Admitted to the hospital June 6, 1888, at 10:20 p. m.

This case occurred during my service as house surgeon of Cook county hospital, in the service of Dr. Price.

While intoxicated the patient fell from his coach seat, sustaining an injury to the back which produced complete paralysis below the nipples. Priapism marked, especially on slight motion of the back. Retention of urine and feces. Perfectly rational, with normal pulse, temperature and respiration. No apparent deformity of the back, very tender in cervico-dorsal region. Holds head erect.

I examined the patient for the first time the evening of June 7 (20 hours after the accident.) Anæsthesia and paraplegia as high as the second intercostal space, and as there was no temperature, operation was decided upon as being the only means of relieving any possible compression from depressed bone or blood clot.

As my attending man was about to leave the city, he kindly relegated the operation to me. Operation on second day under ether, a vertical incision 6 inches long made parallel to the spinous processes. Fracture of right lamina of seventh cervical found with depression of fragment. Lamina and spinous process removed as was the extradural blood clot. Cord appeared in good condition. Bone drainage. Muscles sutured with catgut, skin with silk.

9th, a. m., arms somewhat paretic and symptoms of paralysis gradually spreading upwards.

At 3:50 p. m. had a spell of tremor and a sudden rise of temperature to 107, followed by death. Post-mortem showed fracture of body of vertebra with penetration of right lung, some blood clots and septic myelitis. The external wound aseptic and clean. The fact that the external part of the wound was perfectly clean and that the cord was directly connected with the wound of the lung serves as an explanation of the septic inflammation.

Case 2. Fracture of and dislocation between the tenth and eleventh porsal vertebræ—paraplegia—operation—complete recovery:

J. K., aged 31 years, teamster, German. About 10 a. m. on March 11, 1891, he was riding on a load of brick, and while driving under a low shed was struck just below the nape of the neck, while his body was in an extremely stooped position. As the wagon proceeded the ends of his vertebral column were brought nearer to each other than the anatomical continuity would permit, and consequently he sustained a fracture and dislocation of the vertebræ which will be described below.

I saw the case about five hours after the accident and obtained this history of the injury: at the time of the accident he felt "somethink break," and after the wagon had cleared the shed he was lying flat on his back on top of the load. He tried to get up, but found that he could not elevate his trunk or move his legs at all. In answer to his cries friends came to his assistance and lifted him from the wagon and tried to stand him up, but his legs would not support him; then they tried to sit him up in a chair, but the slightest relaxation of their support caused him "terrible pain," as he put it.

When I saw him he was lying in a semi-prone position and complaining of severe pain in the middle of his back and over the front of thorax and abdomen, and also of a sensation as though a strap was fastened around him about the umbilicus.

Examination:—An immense swelling over the whole dorsal region was noted, also marked deformity of the back. It was found that there was a marked prominence about the eleventh vertebra and an equally marked depression just above it. The immense diffuse swelling was soft and semi-fluctuating, being caused by extensive extravasation throughout the subcutaneous tissues. Palpitation at the point of injury caused severe pain. The blood clot beneath the skin was so extensive and thick that we are unable to determine positively the presence of crepitus, though at times we thought we could detect it. Upon further examination, I found that there was complete motor paralysis below the umbilicus, including paralysis of the bladder and rectum, with hyperæsthesia of the corresponding surface.

There was no reason to doubt that we had compression of the cord, and that the compression was caused by direct counter pressure of the two vertebræ. That the cord was not pulpified nor completely severed was shown by the hyperæsthesia, which indicated an irritation of the sensory nerves or tract and not a complete interruption of the cerebro-peripheral continuity. This being the case it was not deemed advisable or necessary to place the patient in a position to test the deep reflexes. The cremaster reflex was present.

Being uncertain as to the presence or absence of a fracture of any of those parts of the vertebra which enter into the formation of the spinal foramen, and remembering that a dislocation of one vertebra upon another is quite invariably accompanied by fracture more or less extensive (of the rims at least) of the bodies of the vertebræ, I tried reduction by extension and counter-extension very cautiously. The teachings of Brown-Sequard, that "the ascending inflammatory lesions of the cord, which follow injury to the spine, are caused by the irritation of fragments of fractured bone," caused me think it inadvisable to try forcible reduction by great extension, rotation, etc., and as there was a probability of an accompanying hemorrhage about the cord, an operation seemed to me the only rational scientific procedure.

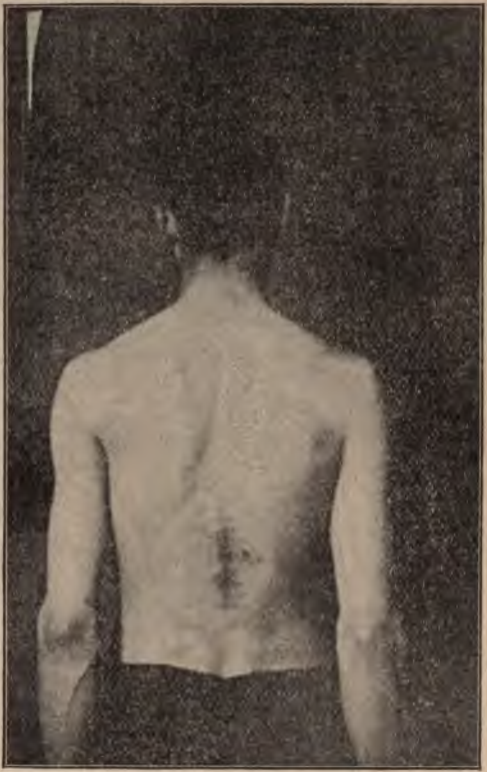
There had been no improvement whatever in the five hours following the accident. The patient readily consented to an operation, which I performed about seven hours after the accident, with the valuable assistance of Drs. Bush, Piper, Gehrman and Keyes. In this age it is needless to say that the field of operation and everything which could in any way come in contact with the wound was rendered aseptic. Chloroform was adminstered with the patient in a semi-prone position.

An incision five inches long was made in the median line; my intention was to have made it a little to the side, but the position of the patient and the great swelling misled me to some extent. After cutting through the superficial fascia, which was distended to the thickness of about one and one-half inches by extravasated blood, we found that the muscles of that region, the vertebral apponeurosis, and all the inter-vertebral ligaments had been ruptured transversely, in fact, broken. The tenth vertebra was found dislocated forward upon the eleventh, the lamina of the tenth resting on the body of the eleventh, with the flattened cord between. I could not detect any fracture of the spinal arches, but found fractures of the articular processes, fragments of which were lying in close contact with the cord. These were removed.

The introduction of the finger down to the cord determined the fact that the spinal canal was filled with a firm extradural blood clot which was easily broken down with the finger. Considerable hemorrhage followed the withdrawal of the finger. Irrigation with quite warm sterilized water served the double purpose of washing out the clots and stopping the hemorrhage. The anterior and posterior longitudinal veins, the former of which are, normally, nearly the size of a small lead pencil, had been severed. The interval between the tran sverse processes of the two vertebræ easily admitted the finger, which detected a large blood clot anterior to the bodies of the vertebræ in the posterior mediastinal space. It was removed by irrigation. All the hemorrhage having been controlled, reduction was affected by following the rule which the late Prof. Gunn offered concerning dislocations of the hip, and which is quite as applicable in all dislocations as in those of the enarthrodial joints, viz.: "First, place the parts, as near as possible, in the position in which they were at the time of escape; and, second, reverse the force." I followed this as much as possible, by first flexing the trunk, and second, by making extension and counter-extension from the shoulders and legs, and local elevation of the upper segment with depression of the lower.

The vertebræ were thus brought into position, but the articular processes would not approximate properly, and on slight motion of the body would slip by each other. To maintain the parts in proper position, I connected the two spinous processes by means of a very large silk ligature, inserted through drill perforations of the upper part of the tenth and the lower part of the eleventh spinous processes near the laminæ. By this means we are enabled to completely reduce and maintain the segments in proper coaptation.

Owing to a tendancy to ooze, it was deemed advisable to use tubular drainage, so as to prevent the possibility of pressure by the reformation of a blood clot near the cord. Accordingly a small rubber tube was placed anterior to the vertebra and out through the wound, while a large short tube was inserted down to the laminæ, and brought out through an opening made about two inches to the right of the first incision.



The torn ends of the muscles were then accurately coaptated by means of silk, the wound dressed and a plaster of paris cast applied.

The patient remained in a prone position, with upper part of chest and shoulders somewhat elevated, until the cast had dried. There was nothing particularly irregular in the history of the case during the stage of wound healing and complete repair. He had involuntary bowel movements for two days and had to be catheterized for a similar length of time.

During the second twenty-four hours had a temperature varying from 99 to 101.2, with rapid and labored respirations—thirty-two to thirty-six per minute. He felt very well, however, and took abundant nourishment. We considered the symptoms as indicating only fermentation fever, and as the kidneys were secreting an abundance of urine, we did not think any medication necessary.

On the morning of the 13th, forty hours after the operation, voluntary use of the gluteal muscles was present to a slight degree. Twelve hours later could rotate the limbs quite freely and could adduct them about eight inches each.

March 14th, no bowel movements. Could urinate voluntarily. Morning temperature, normal; evening. 102.2; respiration, 20 to 24.

March 15th, a. m., temperature 99, but as it was 100.6 at noon a laxative was administered; p. m., temperature 101.2, which subsided after free catharsis to 99.4 and respiration to 24. Hamstring muscles could be used to slight extent.

March 16th, began to have voluntary bowel movements. Motion manifested in the flexors of the toes. As there had been a little temperature for 36 hours (99 to 101.2) it was deemed advisable to dress the wound. A fenestra was cut over the site of the operation. The dressings were found saturated with a reddish colored fluid. No odor of decomposition. Ends of tubes occluded with blood clots, but no evidence of blood clots deep in the tubes or wound. Irrigation with sterilized water and new dressings applied.

March 17th to 20th inclusive. Temperature was 99 or less. Gradually obtained use of muscles of legs and feet and lastly of quadriceps extensors, which are possibly a little weak yet.

Some of the movements were as yet weak and uncertain in their execution, but progressive improvement was appreciable in all the muscles. The bowel movements having soiled the cast it was removed on the 20th. Wound perfectly clean and union by "primary intention." Drainage tubes removed and new cast applied. There being no rise of temperature or other unfavorable symptoms the cast was allowed to remain on four weeks.

Five and one-half weeks after accident cicatrix found to be firm. No discharge and only small bunch of exuberant granulations over drainage holes. These were removed and surfaces healed within a week. During this week he remained in bed without a cast. About May 1st a cast was applied and he was allowed to be around in a wheel chair, and then with crutches. The last cast was removed about the middle of June.

The case presents points of great interest, and in this connection I desire to mention a few of the more important reasons why operative measures were in this case justifiable. Horsely's belief that "operation should be resorted to in all cases where displacement or crepitus indicates compression, and where extension directly after the accident clearly fails to reduce the deformity, provided there are symptoms present which indicate interference with the functions of the cord," is undoubtedly more in keeping with the step of modern surgery than the statements of Hutchinson and L. Clark, who sweepingly condemn all such operations as unjustifiable. The practice of great extension and forcible rotation is certainly far from being a safe procedure in any case, since by forcible movement of a fragment which may be in close proximity to, or in contact with the dura or the cord itself, an extensive laceration of the meninges and of the cord substance might be produced.

As "the proof of the pudding is in the eating," so the proof of the justifiability of an operation is in the pathological conditions found and the success of the efforts for their removal. In this case we encountered three important pathologico-etiological conditions which we were able to remove. First, small fragments of bone, which, as before stated, might cause a fatal inflammatory process.

Second, extradural extravasation of blood. In this case the spinal canal and the surrounding parts were filled with firm blood clots, and I do not believe that reduction simply would have relieved all of the compression.

Third, dislocation, etc. As a result of operating we were able to effect a complete reduction of the articular processes, as well as of bodies of the vertebræ, and to employ efficient means for the maintenance of the reduction, and also to make an anatomical coaptation of the divided muscles, etc., all of which, of necessity, add to the appearance, strength and usefulness of the spine.

From the conditions noted, I believe that operative procednre was justifiable; the result is all that could be desired. The patient is now a well man, earning his livelihood as a coachman. He can flex, rotate and extend his spine with perfect freedom and says the strength seems to be as good as ever. As the ligaments were all torn across, this case does not support the claims of a weakened back from dividing the supra and inter-spinous lagaments as suggested by some.

The two photos here presented show the line of incision and point of drainage in the one and the uniformity of the curve of his spine when he stoops in the other, the slight depression notes the location of the dislocation and the depression is caused by the normal contracture of scar tissue.

Case 3. Fracture of fifth and sixth cervical vertebræ—lamnectomy 20 hours after injury—death eight hours after operation:

C. H., 29 years old, found in a basement and brought to Cook county hospital June 25, '91, in an intoxicated condition.

Paraplegia was casually noted but attributed to general relaxation from his intoxicated condition, and he was sent to the ward for the night "to sleep it off." Upon examination next morning complete paraplegia was noted, including the arms, anæsthesia as high as the third rib, involuntary bowel movements, incomplete erection of penis. Temperature 97.8; pulse normal. Diagnosis of spinal hemorrhage made by one of the internes and the case sent to a medical ward. No deviation of spine nor other deformity was made out at this time.

His respiration became more shallow and temperature gradually rose to 105, when he was seen by Dr. Senn, myself and others. The face was intensely flushed and hot and the respirations hurried and labored. It was learned that he had fallen about eight feet over a railing and struck on his head where there was a contusion about the size of a silver dollar. Displacement of the spine of about the fifth cervical vertebra was noted. All reflexes were abolished. Rapid dissolution was taking place and the patient readily consented to an exploratory operation.

Patient chloroformed and placed in a nearly prone position. Incision six inches long in median line. Spinous processes with right laminæ of fifth and sixth cervical vertebræ freely movable with crepitus and depression. These were removed and the pulse and respiration became perceptibly better, being slower and fuller. Considerable fluid and clotted blood outside the dura mater. Dura intact and as the cord was apparently intact and no evidences of intradural hemorrhage, it was not opened (which was of course a mistake).

Tubular drainage placed down to cord and wound approximated with silk and dressed antiseptically. Patient died about nine hours after operation. We were unable to get a post mortem and therefore were unable to determine the exact pathological condition.

The operation in this case was made more for information as to the local appearances which we could confirm by post mortem than in the hopes of doing him any good, as death was inevitably approaching and therefore we especially regretted our inability to get a post mortem. As it was, his life was unquestionably prolonged at least four hours by the procedure.

Case 4. Probable fracture of second dorsal with forward dislocation—no operation—death.

H. C., 17 years old, was running on top of moving cars and fell between two of them and was rolled over endwise under the brakebeams for about two car lengths, as I now remember it.

Examination at that time revealed considerable general shock, with paraplegia below line of the nipples and probably anæsthesia to the same extent. There was marked pripiasm immediately after the accident.

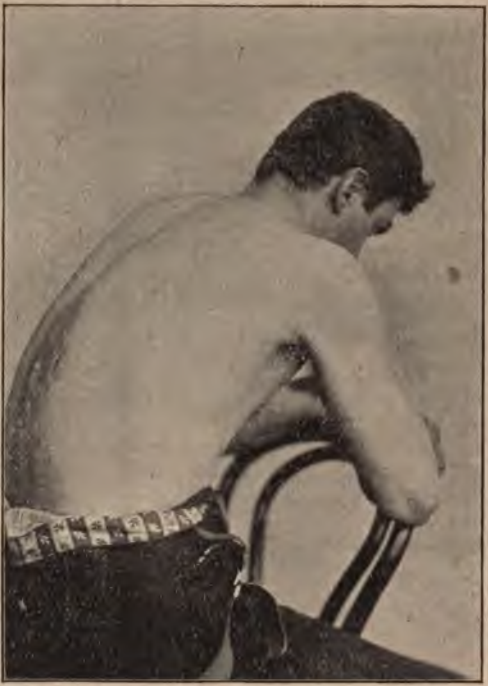
I saw the case about 20 hours after the accident and found him semiconscious with a tendency to drowsiness (possible caused by the hypnotic which was being administered) complaining of severe pain in the cervico-dorsal region, with an area of hyperanthesia extending from nipples to above clavicles, which I was informed had been gradually extending upwards. Sensation below the nipples uncertain, at that time, but I was quite positive that he could at times recognize sense of pressure, although his condition prevented any accurate statement relative thereto. Penis semi-erect. Had had no bowel movements, and urine had been evacuated by catheter. Sphincters not paralyzed. Upon examining the back, I found a depression of the second and a marked prominence of the third dorsal spine, but was uncertain as to crepitus.

The temperature had been but little above normal until about three hours before I saw him, during which time it had gradually risen to 104,2 with pulse of 96. Respiration free and easy. Face somewhat flushed and hot. Owing to the surrounding circumstances and the shortness of my time I was unable to test the reflexes. To me the diagnosis of fracture, probably of the bodies of the vertebræ, with dislocation forward of the second, with compression and possible destruction of the cord, was evident; while other physicians who had seen the case had diagnosed it as hemorrhage, but I was unable to find out the points upon which that diagnosis should be made, as against fracture with displacement.

In either case I deemed an operation justifiable and even advisable under the circumstances and obtained the assurrnce of the patient's father that he would bring him into the hospital on the next train, for operation. This he failed to do, as I afterwards learned, on the advice of the attending physician, who considered it simply a spinal hemorrhage and discouraged any operative attempts at relief for at least another twenty-four hours. The temperature gradually rose to 106 and higher, with unconciousness, and death occurred about 48 hours after the accident. The body was transported out of the county before I was aware of his death and therfore I was unable to get a post mortem.

Case 5. Partial dislocation between the seventh and eighth dorsal vertebræ:

N. C., 38 years old, laborer, while at work on the 30th of April, 1892, fell into a hole, a distance of 16 feet, striking on his head. The leg fell forward. He was brought to the hospital immediately after the accident suffering a great deal with pain in the epigastrium. Upon examination a point of great tenderness was found over the seventh and eighth dorsal vertebræ, with a slight depression of the seventh spinous process and a distinct angularity existing at this point of the back. There were no symptoms of any spinal cord injury. No efforts at obtaining crepitus were made. He complained of a great deal of pain upon slight movement and of great tenderness upon palpitation.



The patient was placed upon a wide posterior splint, very heavily padded to correspond to the normal curves of the back and neck. At the end of a week a heavy plaster of paris cast was applied with the patient in a prone position, the weight of the body resting on the upper part of the chest and hips, which position corrected the deformity.

If repair has not progressed properly by the middle of June I will not hesitate to cut down upon the spinous processes and to silk them into proper position, and will expect a good result in the end. It is a question to me whether this would not have been a feasible procedure at the beginning. At

present he is doing nicely, is in the best of spirits and the best of general health.

Case 6. Fracture of the spinous process of the seventh cervical vertebra:

P. A., 30, single and a laborer, was struck on the head by a railroad rail, falling at least eight feet. This occured May 15, 1892, and he was brought into the hospital shortly after, where, upon examination, a scalp wound was observed about six inches in length across the top of head in the line of the coronal suture. No fracture of skull.

Complained of considerable pain in epigastrium; pain and tenderness in cervical region upon movement of head or local manipulation, however slight, with apparent slight depression of fifth and sixth cervical spines and an undue prominence of the seventh. Crepitus of the seventh, and possibly of the sixth, readily detected. Emphysema of right side of neck above the clavicle. Motion, sensation and reflexus normal. Retention of urine for 24 hours after accident. Bowels had not moved for four days notwithstanding the use of calomel and sodi bicarb.

Temperature 100.4 on eve of first day, since then 98 to 99.6 and once to 100. Pulse usually below 80. On the fourth day, emphysema disappearing, feels well; can elevate and rotate head easily and without pain. Crepitus is distinct. The fracture was undoubtedly produced by great flexion of the neck, and probably the traction on the ligamentum nuchæ resulted in the fracture of the vertebræ prominens. The emphysema must have been caused by a laceration of the trachea or possibly of the æsophagus or possible fracture involved the body of the vertebræ and a spicula of bone penetrated the apex of the left lung.

There not being any symptoms of injury to the cord the patient was placed on a posterior splint, and as the emphysema was disappearing, a plaster cast was applied on the fourth day about the chest and shoulders, supporting the head and neck in an erect position. Should union not have taken place by the time of my return, about the middle of June, I will consider the advisibility of absolute fixation of the fragment by operative measures.

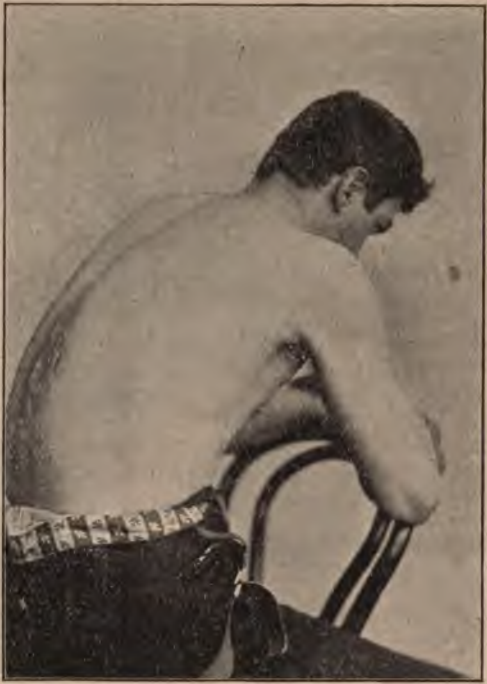
Case 7. Comminuted fracture of the arch and body of the eleventh dorsal vertebræ, etc., with dislocation between the tenth and eleventh, with compression and probable destruction of the cord—operation three weeks after accident—yet under treatment:

C. A., aged 26, locomotive fireman, was injured April 3, 1892, by being brushed off the side of a box car in front of another car and crushed between the car and station platform. He sustained several scalp wounds, a crushing injury of right forearm, necessitating amputation, and an injury to the back which caused complete paraplegia.

After the amputation and closure of scalp wounds he was removed to his father's home, a distance ot about eighty miles, where I saw him in consultation with Dr. G. W. Johnson, three weeks after the accident. We found a patient six feet three inches tall, in splendid spirits and good general health. Dr. Johnson informed me that at first there was retention of urine and feces, but during the previous 48 hours incontinence of urine had begun and that it was quite ammoniacal. His temperature had at no time been over 100 and most of the time normal, notwithstanding the fact that there was slight suppuration in the amputation wound.

Case 5. Partial dislocation between the seventh and eighth dorsal vertebræ:

N. C., 38 years old, laborer, while at work on the 30th of April, 1892, fell into a hole, a distance of 16 feet, striking on his head. The leg fell forward. He was brought to the hospital immediately after the accident suffering a great deal with pain in the epigastrium. Upon examination a point of great tenderness was found over the seventh and eighth dorsal vertebræ, with a slight depression of the seventh spinous process and a distinct angularity existing at this point of the back. There were no symptoms of any spinal cord injury. No efforts at obtaining crepitus were made. He complained of a great deal of pain upon slight movement and of great tenderness upon palpitation.



The patient was placed upon a wide posterior splint, very heavily padded to correspond to the normal curves of the back and neck. At the end of a week a heavy plaster of paris cast was applied with the patient in a prone position, the weight of the body resting on the upper part of the chest and hips, which position corrected the deformity.

If repair has not progressed properly by the middle of June I will not hesitate to cut down upon the spinous processes and to silk them into proper position, and will expect a good result in the end. It is a question to me whether this would not have been a feasible procedure at the beginning. At

present he is doing nicely, is in the best of spirits and the best of general health.

Case 6. Fracture of the spinous process of the seventh cervical vertebra:

P. A., 30, single and a laborer, was struck on the head by a railroad rail, falling at least eight feet. This occured May 15, 1892, and he was brought into the hospital shortly after, where, upon examination, a scalp wound was observed about six inches in length across the top of head in the line of the coronal suture. No fracture of skull.

Complained of considerable pain in epigastrium; pain and tenderness in cervical region upon movement of head or local manipulation, however slight, with apparent slight depression of fifth and sixth cervical spines and an undue prominence of the seventh. Crepitus of the seventh, and possibly of the sixth, readily detected. Emphysema of right side of neck above the clavicle. Motion, sensation and reflexus normal. Retention of urine for 24 hours after accident. Bowels had not moved for four days notwithstanding the use of calomel and sodi bicarb.

Temperature 100.4 on eve of first day, since then 98 to 99.6 and once to 100. Pulse usually below 80. On the fourth day, emphysema disappearing, feels well; can elevate and rotate head easily and without pain. Crepitus is distinct. The fracture was undoubtedly produced by great flexion of the neck, and probably the traction on the ligamentum nuchæ resulted in the fracture of the vertebræ prominens. The emphysema must have been caused by a laceration of the trachea or possibly of the æsophagus or possible fracture involved the body of the vertebræ and a spicula of bone penetrated the apex of the left lung.

There not being any symptoms of injury to the cord the patient was placed on a posterior splint, and as the emphysema was disappearing, a plaster cast was applied on the fourth day about the chest and shoulders, supporting the head and neck in an erect position. Should union not have taken place by the time of my return, about the middle of June, I will consider the advisibility of absolute fixation of the fragment by operative measures.

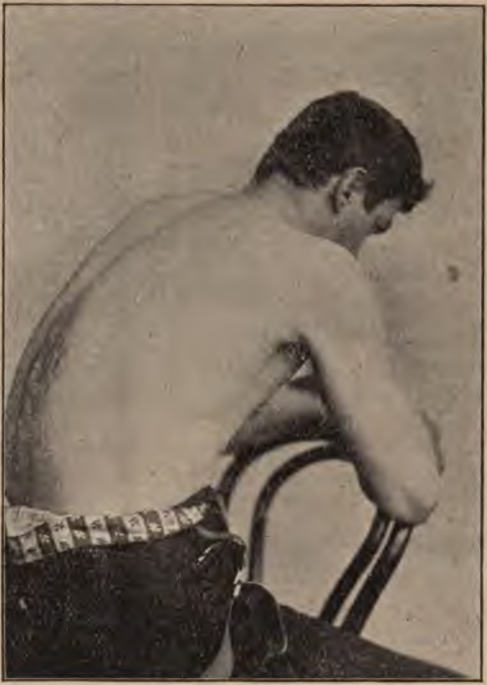
Case 7. Comminuted fracture of the arch and body of the eleventh dorsal vertebræ, etc., with dislocation between the tenth and eleventh, with compression and probable destruction of the cord—operation three weeks after accident—yet under treatment:

C. A., aged 26, locomotive fireman, was injured April 3, 1892, by being brushed off the side of a box car in front of another car and crushed between the car and station platform. He sustained several scalp wounds, a crushing injury of right forearm, necessitating amputation, and an injury to the back which caused complete paraplegia.

After the amputation and closure of scalp wounds he was removed to his father's home, a distance ot about eighty miles, where I saw him in consultation with Dr. G. W. Johnson, three weeks after the accident. We found a patient six feet three inches tall, in splendid spirits and good general health. Dr. Johnson informed me that at first there was retention of urine and feces, but during the previous 48 hours incontinence of urine had begun and that it was quite ammoniacal. His temperature had at no time been over 100 and most of the time normal, notwithstanding the fact that there was slight suppuration in the amputation wound.

Case 5. Partial dislocation between the seventh and eighth dorsal vertebræ:

N. C., 38 years old, laborer, while at work on the 30th of April, 1892, fell into a hole, a distance of 16 feet, striking on his head. The leg fell forward. He was brought to the hospital immediately after the accident suffering a great deal with pain in the epigastrium. Upon examination a point of great tenderness was found over the seventh and eighth dorsal vertebræ, with a slight depression of the seventh spinous process and a distinct angularity existing at this point of the back. There were no symptoms of any spinal cord injury. No efforts at obtaining crepitus were made. He complained of a great deal of pain upon slight movement and of great tenderness upon palpitation.



The patient was placed upon a wide posterior splint, very heavily padded to correspond to the normal curves of the back and neck. At the end of a week a heavy plaster of paris cast was applied with the patient in a prone position, the weight of the body resting on the upper part of the chest and hips, which position corrected the deformity.

If repair has not progressed properly by the middle of June I will not hesitate to cut down upon the spinous processes and to silk them into proper position, and will expect a good result in the end. It is a question to me whether this would not have been a feasible procedure at the beginning. At

present he is doing nicely, is in the best of spirits and the best of general health.

Case 6. Fracture of the spinous process of the seventh cervical vertebra:

P. A., 30, single and a laborer, was struck on the head by a railroad rail, falling at least eight feet. This occured May 15, 1892, and he was brought into the hospital shortly after, where, upon examination, a scalp wound was observed about six inches in length across the top of head in the line of the coronal suture. No fracture of skull.

Complained of considerable pain in epigastrium; pain and tenderness in cervical region upon movement of head or local manipulation, however slight, with apparent slight depression of fifth and sixth cervical spines and an undue prominence of the seventh. Crepitus of the seventh, and possibly of the sixth, readily detected. Emphysema of right side of neck above the clavicle. Motion, sensation and reflexus normal. Retention of urine for 24 hours after accident. Bowels had not moved for four days notwithstanding the use of calomel and sodi bicarb.

Temperature 100.4 on eve of first day, since then 98 to 99.6 and once to 100. Pulse usually below 80. On the fourth day, emphysema disappearing, feels well; can elevate and rotate head easily and without pain. Crepitus is distinct. The fracture was undoubtedly produced by great flexion of the neck, and probably the traction on the ligamentum nuchæ resulted in the fracture of the vertebræ prominens. The emphysema must have been caused by a laceration of the trachea or possibly of the æsophagus or possible fracture involved the body of the vertebræ and a spicula of bone penetrated the apex of the left lung.

There not being any symptoms of injury to the cord the patient was placed on a posterior splint, and as the emphysema was disappearing, a plaster cast was applied on the fourth day about the chest and shoulders, supporting the head and neck in an erect position. Should union not have taken place by the time of my return, about the middle of June, I will consider the advisibility of absolute fixation of the fragment by operative measures.

Case 7. Comminuted fracture of the arch and body of the eleventh dorsal vertebræ, etc., with dislocation between the tenth and eleventh, with compression and probable destruction of the cord—operation three weeks after accident—yet under treatment:

C. A., aged 26, locomotive fireman, was injured April 3, 1892, by being brushed off the side of a box car in front of another car and crushed between the car and station platform. He sustained several scalp wounds, a crushing injury of right forearm, necessitating amputation, and an injury to the back which caused complete paraplegia.

After the amputation and closure of scalp wounds he was removed to his father's home, a distance ot about eighty miles, where I saw him in consultation with Dr. G. W. Johnson, three weeks after the accident. We found a patient six feet three inches tall, in splendid spirits and good general health. Dr. Johnson informed me that at first there was retention of urine and feces, but during the previous 48 hours incontinence of urine had begun and that it was quite ammoniacal. His temperature had at no time been over 100 and most of the time normal, notwithstanding the fact that there was slight suppuration in the amputation wound.

Even admitting that the trainmen suffer as often as the enginemen, I do not think they suffer to as great an extent. Even passengers suffer at times. At the end of a recent ride of 3,500 miles I noticed that micturition was markedly more frequent, and there was no other cause that I could discover. I should add that I did not think of the cause until after I had noticed the symptom. The irritation in this case would no doubt have gone further had I continued the ride.

I have no doubt that the trouble is aggravated in some cases by the condition of the central nervous system in those engineers whose runs make a severe demand upon their nervous energy. Disturbing causes which might otherwise be capable of no injury to the patient become sufficient in this manner to be noticeable; these cases being anaolgous to those gynecological ones described by Goodell, in which the bladder irritation is noticeable, not so much from the pressure of the womb in a state of anteflexion upon the wall of the bladder, as from the fact that the nerves are in bad order.

I feel perfectly sure that a certain proportion of those who believe they have this affection are suffering from muscular rheumatism. *A priori*, we should expect men as much exposed to the vicissitudes of the weather as are all trainmen to be affected in this way. It is not strange that firemen and brakemen should notice the stiffness in the back, when we reflect that they use those very muscles so severely. These cases do not have the bladder symptoms seen in the others, and are frequently promptly relieved by the exhibition of the remedies usual for lumbago.

The average engineer believes that the jarring of his kidneys is the source of all his woes. The symptoms resemble those of the aching kidneys which we see at times, and it is reasonable to infer, I think, that these organs may assist the bladder in causing the reflex pain in the back. I have never found reason for thinking these men more subject to organic disease of the kidneys than others, however.

That the affection is not due to congestion of the spinal cord would seem to me to be proved by the fact that none of the patients complain of the symptoms which the neurologists mention in connection with this trouble, as the belt sensation, incontinence of urine, paralysis of the abdominal muscles, of the anal sphincter, and other parts, This may certainly be fairly excluded.

I believe that strain of the muscles of the back is accountable for much of the trouble of which especially firemen and brakemen complain. These are more affected than others with this form because upon them devolves most of the severe muscular labor of handling the train. The strain from the effort of balancing would be no greater in others than in these, of course, and so could scarcely be worth considering. In sailors, who must be equally exposed to the operation of the latter cause, there is, so far as I am aware, no disease similar to the one we are considering. As corroborative evidence, I refer to the statement of trainmen generally that the brakemen complain less, as we should naturally expect, since the general use of air brakes on freight trains. They are thus saved not only severe muscular labor in a cramped position, but much exposure in bad weather. As evidence that the effort of preserving the balance does not enter into the question, it should be stated that many trainmen state that the difficulty is less when standing than when sitting. I have known of some instances in which firemen, especially when new to the work, stood for the entire length of the run, for the reason that sitting made the pain intolerable.

It seems to me that the arguments just adduced entirely dispose of the sixth theory, so that we need not consider it further.

As to treatment, I am able to give but little that can be of value. The rheumatic cases have been treated as any others would be with lumbago, and with a fair degree of success. But these have been the ones who have had no urinary symptoms. With those that have, cessation of work seems to be the most commonly advised remedy, and it is, of course, reasonably efficient for the time. Change to a form of train work in which less is demanded of the muscles of the back gives the fireman who has strained those parts an opportunity to recover. It would appear that remedies which lessen the sensitiveness of the neck of the bladder should relieve the ordinary form, but I have not tried this as yet sufficiently to give an opinion on the matter. Belladonna and the bromides should theoretically be of value because of their action on the vesical neck.

I should add, in closing, that it seems to me of more importance to discuss the pathology of the disease than its treatment, as we are at present situated, for the treatment would be less difficult if we had a correct idea of the exact seat and nature of the lesions causing the disturbance.

Diagnosis and Prognosis in Surgical Lesions of the Spinal Cord and Its Coverings.

[By Thomas H. Manley, M. D., New York.]

By the term surgical lesions is meant those which chiefly result in consequence of mechanical or physical influences, and which most commonly in their inception, or later, come under surgical treatment, as a result of accident, injury or disease,

These cases may be grouped in two divisions; first, those arising in consequence of direct violence; and second, those which are, apparently, solely dependent on pathological, degenerative changes; the one being the result of sudden and external causes; the other a condition brought about through internal constitutional changes, connected with the circulatory system, and invariably of a gradual onset.

It has been said that diagnosis is the foundation of success in the management of any sort and type of lesion, whatever, and that its cultivation is of as much importance as that of treating diseases. For, with a true kuowledge of the exact nature of a malady, the way is clear for remedial measures. That the art of diagnosis is highly important, no one will deny; yet, when one considers the vast amount of time which is being now consumed by students in attaining this acquisition to the neglect of the study of practical therapeutics, it would seem that a mistake is being committed, and, that while the young aspirant is full of theory, he knows little or nothing about what may be regarded as the main object of surgical science—of treatment. Hence, while regardless of the precise sensation, nearly all painful lesions along the lateral planes of the spinal canal are treated by similar agencies, so that on entering on the study of diagnosis of affections of the axial plane of the back it is undertaken as much for its bearing on the ultimate termination of a lesion, and the extent of damage to structure sustained, as for the light it will throw on measures for relief.

The spinal region furnishes us with a practically unexplored field for the ambitious, enterprising and energetic to enter, where he may crown his brow with a wreath of never-fading laurels; for exclusive of what has been done by physiologists in modern times in the way of studying spinal function, there has been comparatively little accomplished. The surgery of the skull and its contents, and the abdomen, with the enclosed viscera, has been greatly extended during the past quarter of a century; but the cavities and contents of the thorax and the spine have, thus far, generally defied the best efforts of the surgeon and resented with a positive intolerance nearly every sort of mechanical intrusion. The application, however, of physics, chemistry and biology has led to such marvellous revelations in thoracic diseases that it may be said, to-day, that the diagnosis of them has practically reached perfection. This is not so with the rachidian region, for as yet there remain many unsolved problems in connection with the recognition of localized diseases here situated. As a contribution which, it is hoped, may aid to the further elucidation of the subject, this essay is offered.

Before proceeding to a consideration of the details of the subject, it is important to have a clear understanding of certain terms employed in connection with the rachidian region.

A man is said to have had "his back-bone broken," has sustained "a serious injury to his spine," has had "concussion of his spine."

Now, no one can well have broken his back-bone when he has no such bone, nor have a fractured spine while this is not composed one bone but a chain or segment of bones; so that it seems rather an abuse of language to designate the mere fracture of one or more of the spinous processes as in injury, in which one would infer that the contiguity of this series of osseous segments was destroyed. Hence this latter term should not be employed here, and another more definite should take its place.

"He has had a serious injury of the spine." What are we to understand by this? Is what is designated the spine the mere osseus elements of the back or does it include the cord, ligaments, tendons and muscular structures? Certainly it must be understood to include the soft parts, or nothing; as, when we speak of the head, hand or leg we always understand it to include everything which goes to make it up.

For ordinary purposes it may suffice to say that such a case is a "spinal injury." But, scientifically speaking, it is too vague and will seldom answer unless the injury has been very great.

"Spinal concussion" is another vague and indefinite term. Its employment is intended to convey the idea that the cord has been injured when, as a matter of fact, the spine may be shaken or concussed with such violence as to cause a painful crippling without the elements of the cord suffering in any particular whatever.

The patient has had spinal hemorrhage. But, as the spine and cord have five separate systems of vessels, the important question is, which one has sustained a rupture? Is it understood that there is bleeding under the skin, the muscles, the bones or the membranes, from the integument inward? The consequences ensuing after traumatic injuries of an extrinsic origin, as might be expected, are prompt in making their appearance.

In order then to more clearly define the lesions attributable to mechanical agencies, we must have a clear comprehension of them; what they are and how they act.

They spend their energy on the back in divers ways according to circumstances. They are of an active and passive description. The damage which is inflicted depends not only on the volume of weight of what is brought to bear, but its velocity and direction, and the part of spine on which it operates, whether something has fallen on or struck the body, or, on the contrary, whether the body itself has struck against something. Penetrating lesions which make their way into the spinal canal are not considered in this summary. Accordingly, we may expect to find the effects of twists, sudden extension, concussions, contusions, ecchymosis, free hemorrhage, injury of the nerves, laceration of muscle, tendon or ligament, a fracture or dislocation of bone, with or without structural implication of the medulla-spinalis. Of the fifty-four serious cases of spinal injuries attended by paralysis which have come under my care, all except four occurred in men, and twenty-nine of them resulted from falls; but four occurred from blows or compressive force applied directly to the body. It is quite impossible to seriously injure the healthy spinal cord by blows of the fist or kicks. The muscles may be bruised or torn and the vessels ruptured, but to reach the cord the force must be of a very concentrated character and be frequently repeated.

EXTRINSIC INJURIES OF THE SPINE.

The diagnosis of extrinsic injuries of the spine in the vast majority of cases is not difficult. They are pre-eminently those which are so common, often giving rise to only moderate inconvenience; when the patient says he has a lame back. Vertebral movement is considerably impaired, and over certain areas; there is well marked hyperæsthesia, with more or less limitation of vertebral movement. We will encounter these cases in varying degrees of severity. The pain, soreness and stiffness which characterize them are seldom of long duration. In fact, it is only those cases of an aggravated description that ever come under our observation.

But there is another class of cases which belong to the same order that is of a more grave description. The sensory nerves and the reflexes are not involved, but there is a helpless crippled condition of the middle and lower part of the trunk, and great pain is felt on the slightest motion of the muscles of the posterior wall of the trunk. The pathological condition is mainly myopathic and arthritic with peripheral neuritis and diffuse cellulitis.

These are the cases which so often ensue from falls from a considerable height, or from violent crushing, causing a sudden and violent twisting and stretching of the muscles, with extravasation of blood into the lose connective tissues, with tension or rupture of the peripheral nerves. A condition of this description may also follow from one being struck suddenly over the shoulders or loins by some massive substance while the body is in a stooped position,

A precise diagnosis in this class of cases is often attended with almost insuperable difficulties. Indeed, for the therapeutical purposes it is not of much consequence, for it will make little difference in treatment. It is very seldom that the scalpel need be employed as an aid to diagnosis with these cases. It must be remembered, however, that they are of the class in which the cord is yet free.

Whether the osseous spurs of the vertebræ are fractured, ligaments ruptured or muscles lacerated, is often difficult to determine. But, as a case may be one in which an action for damages might follow, a most thorough and complete examination should always be instituted.

In order to make a satisfactory examination of the patient his body should be placed in varions attitudes when possible and the most careful manipulation instituted. But this may not be expedient or practicable immediately after injury, hence we must often be content with an examination of the supine in a lateral position only. Immediately after injury we may expect to find the muscles rigid and contracted, the parts tumified and extremely sensitive.

At this time we may ascertain whether there is fracture of the spinous processes, for their tips, all the way from the third cervical vertebra down, may be readily made out by moderate pressure over each. With the transverse processes the possibility of always definitely recognizing a fracture of them is quite out of the question by the sense of touch alone. First, because of their numerous and powerful ligamentous connections they may in the cervical and dorsal regions have sustained a fracture without having been in the least displaced. In the lumbar region the transverse processes lie almost horizontal to the axis of the spinal column, and are short, thick and deeply lodged. I believe the force necessary to fracture a lumbar vertebra will invaribly cause mortal complications. The extent of injury of the peripheral nerves of the back can only be estimated by well defined areas of anæsthesia or hyperæsthesia on one or both sides of the lateral planes. It may occur that a transverse process, having been fractured, the fragment has been so displaced as to have been driven into one of the posterior roots of the cord as it leave the inter-vertebræ foramen.

Two cases of this description have come under my observation. In one the evidence of nerve lesion was emphasized particularly by a numbness of the integments and underlying muscles supplied by the compromised nerve. The victim in this case would not permit of operative interference, and the true nature of the lesion was only made evident at the post mortem examination. With the other patient, a young man, the pain was most agonizing in the vicinity of the deep posterior cervical muscles. In his case a laminotomy was affected by the injury. My interference consisted in simply opening down to the shattered fragment of bone and removing it. It accomplished no good, nevertheless, the pain continuing unabated until death, which supervened six days later.

Deep seated haematoma may usually be recognized by the fullness and the sense of fluctuation present when there has been a considerable extravasate. It will always be well to examine for a fractured rib where the pain is mostly confined to one side. When, after a varying interval of time, it becomes necessary to make a secondary examination, or one is only called to see the case for the first time several weeks or days after the injury, the spine should be forcibly flexed, extended and rotated freely in every direction, particularly in the mobile, cervical and lumbar regions by lateral, longtudinal, direct and indirect pressure, and manipulation should be practiced until every possible, accessible, suspicious area has been well explored, from the occiput to the sacrum.

If we have suspicion that the patient is shamming, an anæsthetic is useful. But a person may refuse to take it. Under these circumstances we must "fight fire with fire," and resort to a ruse. We may, however, in the strumous, weakly or poorly nourished, after spinal injury, have cases in which the symptoms are rather subjective than objective, and the real seat of the difficulty is deeply lodged in the bodies of the vertebræ as in spondylitis, spondylalgia or spondylopyosis, in which manifest tropic changes in the muscles appear only at a late stage in the disease.

In woman the difficulty in the diagnosis is much greater than in men. Being a corset-wearing sex, and not, in this country, accustomed to such occupations as put a great strain on the back; very often their spinal muscles are so soft and wanting in firmness and development that when an injury is sustained in the rachidian region with them we must often be in doubt as to whether the diminution of the muscular fiber is attributable to natural causes or whether it has resulted in consequence of tropic changes induced by violence. It will be well in many of these, while endeavoring to learn the precise nature of spinal injuries, not to confine one's observations to the local districts only, but to always inquire into the patient's antecedent history, hereditary and personal, with a view of determining whether or not he is suffering from a multiple arthritis of a rheumatic type or a neurosis of a neuralgic character. For, not infrequently, particularly when there has been distraint in an enticulation after a trivial injury an action has been commenced for compensation when the local violence has been merely an incident, the *fons et origo* having been of a purely constitutional character.

THE DIAGNOSIS OF LESIONS ARISING FROM INJURIES WHICH ARE CONFINED TO THE CORD MEMBRANES.

The diagnosis of the precise character of lesions which follow the application of physical force in intraspinal cases is almost always an affair of great difficulty.

True, since the extensive and valuable, experimental and clinical observations of the distinguished surgeon of New Jersey, Dr. B. A. Watson, our knowledge of the pathology of spinal cord lesions has been enormously extended, yet in their symptomatology they still remain in considerable obscurity. Certainly, when the violence has been of such a concentrated character as to totally disorganize a segment of the cord by a fracture or dislocation of a vertebra, we need make little hesitation in pronouncing the nature of the condition resulting. But when some time has elapsed before we have seen the patient, it may be quite impossible to say with certainty whether the paralysis immediately resulting is dependent on a local disorganization of the medullary substance, hemorrhage or inflammatory effusion. In my experience I have met with several cases, in which, after injury, paralysis presented itself after varying intervals and in varying degrees; at one time paralysis fully setting in within twenty-four hours, though none was present on entrance; in another, again, only certain sets of nerves being affected, most commonly the lumbar or sacral plexus. Again, the sensory nerves have maintained their integrity, while the reflexes have been in obeyance. Now, whether there is any analogy in the affections following cerebral or spinal concussion, seems to me a question which is by no means settled.

In every instance in which paralysis speedily followed that went on to a fatal termination, and in which an autopsy was permitted, we found hemorrhagic compression of the cord, through a rupture of the meningo-rachidian vessels and escape of blood into the spinal canal, always external to the meninges. Hence, in cases giving a history of having sustained a violent injury in the back not immediately followed by paralysis, but in which it sets in, from six to twenty-four hours later, we may with almost a certainty pronounce it attributable to hemorrhage into the spinal canal, and not as hemorrhage into the cord, for this I have never seen, except in those cases in which the spinal marrow itself was competely destroyed by concentrated force.

But there is a large number which completely recover after symptoms of hemorrhage, and many others in which there has been but a very temporary, transient variety of paralysis; or rather a paresis. These are the cases which have, until quite recently, been designated spinal concussion.

Without question there has been physical concussion of a very serious description, but at that time not the concussion of pathologists. An interesting clinical feature of intra-spinal hemorrhage, when in present considerable quantity, is the absence of tonic or clouic convulsion of the extremities. From its onset through all its varying stages, and unless attended with symptoms of inflammation, there is no jerking, rigidity, or twitching of the limbs. We may then, safely pronounce all cases of paralysis immediately following injury of the spine, when there is no fracture, as due to spinal hemorrhage.

So called fracture of the spine, the fracture of one or more of the spurs of the laminar arch are often difficult of recognition. In the lumbar region the diagnosis of a fracture of them is impossible by the sense of touch. A fracture of any of the spinous processes of either the cervical or dorsal vertabra is simple, when there is displacement, but with the transverse processes of the cervical, owing to their depth the recognition of a fracture of one of them is anything but easy, indeed, it may generally be said that it is quite impracticable. Exploratory incisions have been resorted to as an aid in fractures of the vertebræ; but it is self-evident that a resort to this diagnostic auxiliary is very seldom a justifiable expedient.

Congestion or inflammation of the spinal marrow or the meninges is a common sequel of spinal injury. Hyperaemia or anaemia of the meninges or the medulla-spinalis, as an independent entity, we have no proof ever exists in consequence of physical force. Accordingly in this instance, congestion will be considered as a coincident phase of spinal inflammation only.

The advent of inflammation of the meninges of the cords will be announced by both constitutional and local symptoms; an acceleration of the pulse, rise of temperature and increased bodily weakness, etc.

Of the local indication of the onset of inflammatory changes in the cord the most pronounced and positive will be the commencement of muscular spasms, convulsions and sudden spread of the paralytic range. But the inflammatory changes may not in every case pass beyond the stage of active congestion, when the symptoms will not be so markedly accentuated, and often suddenly subside simultaneously with the restoration of nerve function.

There is one characteristic, quite peculiar and striking, about spinal meningitis secondary to serious injuries of the cord; i, e., its proneness to spread rapidly into the cervical region in the direction of the brain and effect the respiratory centers at the bulb. Several times cases of spinal meningitis which were in my service were first manifest in the lower dorsal or lumbar districts, and subsequently spread upwards with such rapidity as to end mortally within twenty-four hours.

There are cases of meningeal inflammation of a subacute variety, in which their presence must be recognized rather by a grouping of symptoms and by exclusion, which pursue a mild course all through, or may undergo fulminant changes, quickly terminating fatally. They may be recognized principally by a thorough examination of the spine itself and the intigity of the peripheral nerves. The integuments are morbidly sensitive, the underlying muscles are rigid and there are evidences of the meningeal inflammation having extended outward, through the enevelopes of the nerve roots. One set of muscles will be found highly sensitive and another paretic, deep pressure anywhere over the spinous processes always evoking much pain. The patient lies on his back and gives an outcry when moved in any direction. As the movement of his limbs aggravates his discomfort, he keeps them fixed in one position, usually flexed.

With respect to the precise situation of meningeal inflammation of the spinal cord we have ample proof by clinical evidence and pathologied revelation that the inflammatory changes may be of localized character, which never spread beyond definite limits, as in the case in other serous membranes, as the pleura or peritoneum. Hence we may with advantage and propriety designate spinal menigitis as cervical spinal meningitis, dorsal spinal meningitis, or lumbar spinal meningitis.

It might be argued that this is a needless encumbrance of surgical nomenclature and serves no useful purpose to the practitioner. This regional division of the cord, however, in the presence of inflammation, opens the way to a clearer comprehension of the therapeutic demands and the probable prospective course of the case. * * *

Myetitis, or inflammation of the cellular elements of the cord, it is fair to assume, may exist after meningeal inflammation or serious injury to the trophic centers, by which the nutrition of the cord is seriously impaired, and degenerative processes ensue in consequence.

From practical experience, observation and study I am convinced that myelitis of the spinal cord never occurs as a primary condition after injury. Hence, when we have reasons to assume its presence when the nerves are not responsive to the electric current at varying periods after an accident, the most rigid inquiry should be instituted to determine whether or not there is syphilis or tubercle at the bottom of the malady rather than primary myelitic degenerative changes. The diagnosis of spinal myelitis is reached mainly by a process of exclusion. Its clinical characteristics are its gradual onset; different nerves, or sets of nerves, becoming alternately affected, until the paralysis has advanced to the base of the brain. Its development is almost invariably attended with constant, vague, fugitive pains in the limbs, muscular twitchings and neuralgias. There are no definite physical signs by which it may be recognized if we would exclude fatty degeneration and athrophy of striated muscle.

There is a large number of cases that are coming almost constantly under the observation of the surgeon which belong to a sort of mixed type, wherein immediately after injury no one can say absolutely what the exact spinal lesion is, but which in time develop such peculiar and definite features that a diagnosis of them may be with considerable certainty established. There are others of a similar type, those who have never sustained any severe injury of their spines at all, but are bedridden and more or less crippled, until they have mulcted some individual or corporation for damages, or tried to, when they suddenly make their appearance marvelously rejuvenated by a sors of hypnotic suggestion (?) possibly.

Two such cases have come under my observation during the past year; both women, one of the first-class cited and another of the latter, which I report in full to clearer elucidate the subject and to warn practitioners of the caution which they should exercise when called to attend them, not only for the physical well-being of the patient, but to unmask these wretches who thrive on the earnings and savings of others. The first case was referred to me by Dr. Ira B. Reid of this city.

HISTORY.

She entered my service at the Harlem hospital on the 5th of June, 1891, at which time she was wholly paraplegic. Though young—24 years—she looked careworn and despondent, and besides she was considerably emaciated. On physical examination she appeared to have sound organs, and there was no distinctive trace of any acquired or hereditary malady. There was no elevation of temperature, but she had a rapid, feeble pulse. On a careful examination of the spine, from the occiput down, there then was no evidence of disease of the spinous vertebræ, no curvature, angular or lateral. She could maintain the upright position in sitting only, by being supported by one on each side, by raising the trunk in the auxiliary spaces. Her lower trunk and extremities were limp and lifeless as far as motion and sensation went. The muscles of the lower extremities were very markedly atrophied, and had a soft, flabby feeling. She had perfect control over the bladder and rectum, which indicated that the medullary areas in the interior column of the cord were yet free and had preserved their integrity. Owing to her melancholy condition and the prospect of remaining a bedridden cripple for the remainder of her days, she gave way to grief and worry, in consequence of which her general health was greatly reduced.

HER ANTECEDENT HISTORY.

On the 10th day of March, 1891, while walking through the streets of Bridgeport, Conn., she slipped on a patch of ice and sustained a violent fall. For a few moments she was quite unable to move, but in a little while two gentlemen came to her aid, when, with their assistance, she was able to take her feet again and continue on her journey.

For some days she continued her usual employment as a domestic in a family, when very severe pains commenced in her back, and after two weeks from the time of the fall she was compelled to give up. At first she was treated for one thing and then for another, in the meantime paralytic symptoms setting in, and her condition assuming grave features. Her friends, now thinking that something more might be done for her by a change, brought her to New York.

Such was the outline of her history when she came under our observation. Her case was so deplorable for a young person and had so many features of striking interest that I determined to probe it to the bottom and see if I could find a clue as to its real nature which might open a way to a successful therapy. Was that fall the sole cause of her helpless state? Could one possibly so seriously injure the elements of the cord by a fall four or five feet? (Yes; for I have seen a young woman die one week after a fall sustained while skating in a rink, of acute spinal meningitis.) But such a trifling fall can very rarely so seriously injure the spinal cord. Did she have any antecedent malady, as syphilis or tubercle? She denied venereal in the strongest terms; saying that as a single woman she had never exposed herself. She had, however, for a long time before a weak back; she was wont to throw her elbows on a table or other support to ease her back. Long standing or sitting in the upright posture was unsupportable. In other words her case pointed directly to latent but progressive spinal disease of the osseous or ligamentous structures of the vertebral column. The fall, the shock, was the climax. It was this which gave fresh impetus to what had before been pursuing a latent course and brought her to the bed. The case then was not purely traumatic, but a compound of pathological blended with it. The precise relation or bearing of one with the other would be interesting to pursue from a medico-legal standpoint. It is enough at present to emphasize the importance of examining critically every case of this description. Believing that I had simply unfolded the mysterious link in the case I ventured a favorable prognosis; so with a combination of mechanical with a constitutional therapy, she has now so far recovered as to be able to get anywhere she pleases with the aid of crutches, and is daily making steady progress towards recovery, though with a marked angular curvature in the lower dorsal region of the spine.*

My second case: Its history is not so elaborate, though it savored of the dramatic side of life and illustrates the necessity of the surgeon resorting to strategy when he has to deal with a crafty, unprincipled woman. In June of 1890 Dr. J. Conger Bryan requested me to see with him a case of spinal injury in a middle-aged woman who was about to sue for damages. From the history of the case I suspected fraud; though I am sure that she had deceived the doctor, who did not suspect the true character of the schemer he had to deal with.

Her history in a nut-shell was simply this: While hanging clothes on a roof, a board of the rack on which she stood gave way and one leg went down about three feet, while her short, rotund body was jarred by coming in contact with the smooth surface of the platform. She evidently took it into her head that her spine was badly disorganized, for she at once became paralyzed. The owner of the building, a lady, took fright and sent her medical assistance, besides paying her rent and sending a weekly stipend. Dr. W. T. Bull saw the case with the original man. It seems that this eminent surgeon "sized her up," for after his visit the landlady discontinued her assistance, when our patient, not feeling herself so easily disposed of, called in Dr. Bryan, who, after she had been under his care for some time and seeing little progress, asked me to see her.

---

*September 14, 1892—This patient at this time is wholly restored to her health, all paralysis having entirely disappeared. She walks with a quick gait, using no support.

The day and hour were arranged at which I was to call. It occurred to me that I might gather some valuable information by a method which though not strictly ethical I felt justified in resorting to under the circumstances, as I did not intend to be outwitted. I called on her unexpectedly the evening before we were to meet. She lived in a twenty-family tenement house. I entered brusquely and rapped at her door, which was promptly opened by the patient herself, I presumed, from the description I had of her. As I stood in a stooped position in the dark hall while she was in a well lighted room I could see her to advantage, but she could only make out my form in the lightless passage-way. Having made inquiries about a fictitious individual I departed, prepared to deal with her more in detail the following day.

When we met again she was a changed woman, sitting in a large easy chair in apparent pain and unable to move about except in a crippled, indifferent way suggestive of paresis; her head and shoulders stooped; with her spine so bent as to make a developing angular curvature quite distinct. She played her part so well that she was wholly wanting in sensation over the lateral convexities of the spinal column. Anywhere over the immense muscular masses of the back a darning needle could be sent in to the eye without a wince on her part. Her walking was in a sort of staggering, halting, unsteady gait.

Coming down to a severely critical physical examination, her muscular system was firm and well developed. There was none of that feeling so characteristic of a paralyzed muscle, no atrophy or wasting of any set of muscles. But she was past the meridian of life, a widow, who had the appearance of being a free drinker. Now supposing she had paralysis, it would be extremely difficult to define its precise nature, whether or not it was a case of senile myelitis, syphilitic, fibrouis, sclerosis of the poster nerve roots, alcoholic paralysis, paralysis from pressure, due to a malignant neoplastic formation, or from an insidious tubercular formation.

How then, if one is in doubt, can definite information be obtainable in many of these cases? Namely, in one way exclusive of a rigorous physical examination, by time; by repeated examinations and therapeutic methods. If impediments are put in the way in these cases to prevent this, then no definite conclusion as to the real character of the spinal malady is possible. Let this not be forgotten, particularly in alleged traumatisms.

In this connection it is well to constantly bear in mind that the principal motor and sensory areas are lodged in the brain; hence we may have nearly every phase of neurotic symptoms—anæsthesia, hyperæsthesia, paresis and paralysis, when the spine and cord yet preserve their full integrity; when the cause for all the symptoms emanates from the interior of the skull. So that practically we have, in a general way, but two grand classes of paralysis—the encephalic and the spinal. Without doubt in those cases after violent railroad injury in which we see concomitantly with the various phases of of paralysis which sometimes follow them an implication of the nerves of special sense, as those of hearing and seeing particularly, the palsy is purely of an encephalic origin and the brunt of violence has been sustained largely by the base of the brain. This fact is of cardinal importance to constantly carry in mind, in many of those complex, intricate cases of a psychoneurotic character, when we are confronted by mixed phenomena, and a correct diagnosis is sought for.

Space will not permit to enter here into differential diagnosis in cases of spinal marrow diseases of a purely constitutional origin, or those maladies of a local character which only secondarily induce palsy.

THE DIAGNOSIS OF LESIONS OF A CEREBRO-SPINAL ORIGIN WHICH MAY APPEAR SIMULTANEOUSLY, OR CONSECUTIVELY TO CRANIAL INJURIES.

In a brochure which was published by me two years ago* I then emphasized the fact that in all serious concussive lesions of the mobile, cervical spine there is invariably well marked association, immediate or consecutive, of the nerves of the skull which have a bulbar or spinal origin, as well as those the roots of which rise directly from the ganglia at the base of the brain itself.

Erichsen, in his lectures on the "railroad spine," cites several cases in which, immediately after collision in a railroad disaster, there was palpable evidence of spinal injury, but in which, after varying intervals, symptoms manifest themselves denoting, he thought, pathological changes in the substance of the cord. One singular clinical peculiarity about these cases was that they usually recovered.

Dr. B. A. Watson of New Jersey, with a view of clearing up mooted points in the pathology of spinal injuries, made an extensive series of experiments on the spines of etherized living dogs, and concluded from them "that the symptoms resulting after spinal injury were in direct proportion to the nature and extent of the pathological changes in the cord." In other words, the American maintained that tangible and definite lesion of the overlying osseous parts must be present in the majority of cases of grave spinal injury, while the foreigner occupies an opposite position and argues that certain cellular or molecular pathological changes often follow these injuries which do not involve extensive organic disintegration of the medulla spinalis or its bony envelope; but inasmuch as he never had an opportunity to make an autopsy on one of these cases the demonstration of what were the precise pathological changes are is wanting.

At first glance the divergence of opinion with these two able and distinguished surgeons seems almost irreconcilable, although when we examine critically into the writings of both we will see that the actual difference of views is not so great as at first seems to be the case. Erichsen's observations on this subject were confined mainly to its clinical aspects, while Dr. Watson rested his cases, so to speak, almost wholly on conclusions derived chiefly from experimental work on the spines of the lower animals, so that they are devoid of that vital element of analogy which is wanting when we attempt to transfer the deductions derived from animal to man, though they nevertheless possess great value for comparative purposes.

The class of cases to which I wish particularly to ask attention is those which have been principally described by Erichsen, and which I claim are not spinal injuries at all, *per se*, but rather, in the great preponderance of cases, are primarily of a cranial origin, and occupy the medulla-spinalis secondarily, and then rather by functional manifestation than organic changes.

---

*Traumatic lesions of the cerebro-spinal axis. Their etiology, pathology and treatment. Gaillard Med. Ins., Jan. 1890.

Such are those cases in which, after a violent collision, or concussion of the body, sustained while the individual is in full possession of all his faculties, we can find no signs of injury of the spinal cord. The reflexes and sensory nerves are intact and there is nothing to indicate implication of the sympathetic system.

But after a time, particularly in women and in neurotic, excitable men, they commence to complain of dimness of vision, double vision or other ocular disturbances, which may be always accounted for by an ophthalmoscopic examination of the fundus of the eye. The hearing is affected by being either dulled or morbidly acute. Appetite and relish for food are partly lost; the heart action is tumultuous, the pulse being weak and irregular. The patient is anaemic; the skin is blanched, while that covering the extremities is often bedewed by a cold perspiration. The patient becomes weak in the limbs and moves in a halting, irregular gait. Perhaps he has paraplegia or hemiplegia. In given cases there is paralysis of the reflexes only, or *per contra*, movement remains, but there is more or less loss of sensation over localized areas. But the most characteristic phenomena are the intellectual and emotional disturbances.

Such, then, is but a very imperfect clinical picture of the group under consideration. It will be observed that the symptoms indicate an implication of the sympathetic and the cerebral nerves, in the beginning; later the brain—that region concerned in intellection, its base and the medulla oblongata—are the parts chiefly occupied in the pathological changes which give rise to such a complexity of symptoms.

My own impression is that it is a condition arising from great fright, combined with violent force which spends itself on the uppermost cervical segment of the cord, the medulla oblongata and the base of the brain. "Concussion of the brain and spine," then, should be the designation for the condition under consideration. Its diagnosis is possible only by painstaking and prolonged observations and by exclusion. This should be settled as definitely as possible in every case, for, once attained, the difficulties in the way of prognosis and treatment are insignificant. I might add that this clinical portrait is not peculiar exclusively to railroad disasters, although in them one may expect to find it most clearly defined. I have seen it follow runaway accidents, the fall of an elevator, and, in one instance, in a man who escaped death by the falling in of the wall of a building, in which three of his fellow workmen were killed outright.

PROGNOSIS.

The prognosis in affections of the spine or spinal cord which result from physical violence alone is hopeful in the majority of cases. It is unfavorable only in very grave lesions of these structures, the bony encasement, the muscles or nerves.

In external or extrinsic injuries it is the most hopeful; but in that class of them in which the muscles and peripheral nerves have sustained sudden and violent tension, compression or laceration, in which tropic changes follow attended with a fatty interstitial degeneration of the muscular fasciculi, it must be always very unfavorable. The same may be said of those in which the bony structures have suffered considerably, although it may be usually affirmed that when the osseous structures are compromised the cord will almost invariably participate.

Cases are occasionally seen in which there is no positive evidence of medullary or muscular disorganization, yet the patient is permanently, helplessly crippled. Sensation and limited motion remain in the extremities, but he is unable to stand without support or even sit up without some sort of mechanical assistance. They correspond with these which now and then come under the observation of the surgeon, in which after great tension or twisting of an arm or leg it remains limp and motionless for the remainder of life.

These spinal injuries are rare, although in this age of ours of high buildings and the very extensive substitution of mechanical for manual motion, they are becoming more frequent.

Certainly in all cases much will depend on the patient's age, general condition and opportunities for appropriate treatment in aiding us to make an estimate of the probable termination of a given case.

When we are quite assured that the elements of the cord have borne a direct and positive lesion the prognosis is usually very grave. The more promptly paralysis sets in after injury the more grave will be the termination. Paralysis simultaneously with the infliction of violence is always of very serious omen. It implies immediate and more or less complete destructiun of the great nerve cylinder in the vast majority of cases. It may indicate diffuse hemorrhage into the canal, consecutive, meningeal inflammation of a local or general character, which may end in a short time either in death or else in a softening and disorganization of the cord below the seat of injury.

There is a large margin of cases, however, of an intermediate description in which the paralysis appears later, and which undergo recovery, either partial or complete. These, no doubt, are cases of paralysis attributable to hemorrhage alone, the paralysis advancing until the hemorrhage has ceased, and disappearing, more or less completely, with the absorption of the effused blood. The prognosis, then, is hopeful as a rule in spinal hemorrhage when the ascending area of hydrostatic pressure does not extend far up. But in this, as in all serious spinal hemorrhage, as explained by Dr. B. A. Watson, the prospects of recovery will largely depend on whether or not at the time of injury some important internal organ has not suffered participation, as the kidneys, lungs or liver, or a hollow viscus.

The prognosis in those encephalic injuries which may be confounded with spinal, and which give rise to paralysis as far as I can learn and have observed, are hopeful as to termination when the vital centers of the brain have escaped.

With regard to the prognosis, as a rule, in lesions which have reference to the cerebro-spinal structures, it may without doubt be affirmed almost as an axiom to be invariably the case that a definite, absolute opinion cannot be rendered until the patient has been under the continuous observation of the physician for a considerable period of time, and the medical attendant is thoroughly familiar with all the features of his condition, from his inception of the malady to the time at which his opinion is rendered.

As great importance attaches to the correctness of one's forecast, for many reasons needless to enumerate at present, particularly in the class of cases under consideration, those called upon to deal with them should neglect no opportunity to familiarize themselves with the manifold and varying phenomena which always attend spinal injuries at their initial stage.

In these few general outlines my aim has been to contribute something in a fragmentary way towards the elucidation of a study which, until recent years, has been neglected, but which, at present, promises to us a new field of such fertile and profitable observation as will enable us hereafter to better understand the pathological groundwork of these spinal lesions and their complications, the remedial agencies for their relief, and besides to estimate the future probabilities in the way of recovery or continuance of the resulting infirmity.

Operations for Injuries to the Spinal Column and Cord.

[By Surgeon E. M. Robinson, M. D., Bessemer, Mich.]

When I decided to read a paper before this association and announced trephining as my subject I had intended to write upon trephining for injuries of the cranium, but after looking over the program and finding upon it so many subjects pertaining to brain surgery I decided to say a few words relating to operative procedure in injuries to the spinal column and the cord. Not that I propose to enter into a new field or to bring out any new points, but hope by merely referring to the subject and giving what seems to me to be the rational and common-sense way of dealing with these injuries that I may elicit discussion from gentlemen whose experience with these cases far exceeds mine and who are far more able to discuss it. □ I wish to state here that personally I have had no operative experience in this class of cases, though I have had three cases upon which the operation should have been done and upon whom I wanted to operate, but in neither case could I obtain the consent of the patient to have an operation.

One of these cases was a young man who had been shot in the back; the ball struck one of the lower dorsal vertebræ. I saw him soon after he was shot; found him paralyzed from point of injury down, caused from pressure no doubt by misplaced piece of bone or something of the kind against the cord. His bladder was paralyzed, necessitating the use of the catheter three or four times a day, which set up a cystisis and urithitis from which he died three months later. I could not get his consent to a suprapubic cystotomy which I wanted to do for drainage. In this case there could have been no doubt as to the locality of the injury, it being a compound wound, but we should not wait to locate the exact spot, and should not hesitate to do an exploratory operation. Remove if needs be three or four or more with bone-knife or saw and search for the cause and remove it. These cases are sure not to improve much if several days have elapsed without any sign of return of sense of touch to the paralyzed part. We would therefore run no risk of doing harm by the operation.

The other two cases that I have had were negro men, upon whom large pieces of iron ore had fallen from the roof of a mine, striking them while in the stooping posture and fracturing some part of vertebra, causing total paralysis of lower extremities and the bladder. One of these men lived about three weeks, when upon suddenly moving the upper part of body he died instantly. The other one improved a little, got so he could pass his urine without the catheter and is still living, though the accident occurred three years ago. He is not able to move any part of his lower extremities and can feel nothing that touches them. Notwithstanding it occurred three years ago I think he should be operated upon yet, just as the orthopedic surgeon would operate for paralysis from Pott's disease, though no doubt recovery would be more tardy in this case than had the operation been earlier, if he recovered at all.

I think the operation should be done where total paralysis exists and where the sense of touch is destroyed and there is no sign of improvement under the use of remedies which promote absorption in three days. All of the above cases were young, healthy subjects. I mention them to show how prone they are to go on from bad to worse, or at least not to improve to any great extent. Nothwithstanding we rejoice to report recoveries, we some times learn more from cases that do not get well.

* * *

CHAPTER V.

NEUROTIC DISORDERS.

Hypnotic Suggestion in Its Relation to the Traumatic Neuroses.

[By Surgeon J. H. Green, Dubuque, Iowa.]

Within the past few years the nervous phenomena attendant upon injuries have received well merited attention at the hands of competent observers. As a result of the study, old ideas have been modified or discarded, and it would appear that the practical observation will soon cease. Perhaps the greatest impetus to the discarding and modification of old ideas came from the careful reconsideration of the phenomena commonly known as mesmerism. Without doubt the resurrection of this discarded and dust laden therapeutic measure has done more to advance the study of physiological and pathological psychology than anything else within the past decade.

Both as a pioneer and as a competent and careful neurologist Charcot stands eminent if not pre-eminent in this work. He and his assistants have confirmed in a great measure the claims of Dr. Frederich, Anton Mesmer, repeated the fabulous tales of miraculous cures and rehabilitated in a scientific manner the tattered forms of witchcraft and sorcery. In the course of his investigations Charcot propounded his doctrines of the grand and little hypnotism and the three stages of lethargy, catalepsy and somnambulism, each possessing a symptomatology peculiar to and characteristic of itself. These views, however, were soon combated by various persons, chief among whom was his countryman, Prof. Bernheim of Nancy, who claimed that the phenomena of hypnotism were the results of suggestion either by the operator or arising within the subject (auto-suggestion or automatism). A fierce and sacrimonious debate ensued between the schools of the Salpetriere and Nancy, which finally reached its climax in the legal prosecution of M. Eyraud, the murderer.

In this trial the guilt or innocence of the prisoner seemed by far of less importance than the questions involved in the doctrine of hypnotic suggestion. Notwithstanding all this and subsequent debate the question is not fully decided. The approximate truth seems to be that whereas certain so called somatic phenomena can, in certain hysterical subjects, be induced under circumstances apparently excluding suggestion, yet in by far the vast majority of instances suggestion can be demonstrated or is probably present as a factor.

However interesting, it is unnecessary for our purpose to discuss farther the differing views of the Salpetriere and Nancy schools, but we will consider certain fundamental propositions seemingly underlying the subject of hypnotic suggestion in its relation to the symptom group called in modern literature the "traumatic neuroses."

This group embraces, excluding malingerers, those cases formerly so prevalent, if not epidemic, in railroad centers and called concussion of the spine, railroad spine, spinal anamia, etc., its distinguishing characteristic being the presence of numberless subjective symptoms, the paucity as a rule of well marked objective signs and the absence of anything pathognomic.

The phenomena involved in these conditions seem to embrace three factors:

1. A special condition of the higher nerve centers, the hypnotic state.

2. An appropriate or adequate stimulus or suggestion, objective or subjective.

3. The evolution of an idea inducing the given pathological condition or neurosis.

Practically the first two are to be considered together, inasmuch as it is often impossible to give them in their sequence, the injury or its environment being seemingly coincident in point of time in providing both the special condition of the nerve centers and the stimulus or suggestion. Perhaps the time is not fully ripe for considering every case of traumatic neurosis as a hypnotic ailment, but the trend of modern scientific investigation is in this direction, and the belief that traumatic neurosis is but an hysteria induced by a traumatism is held by many competent observers.

A satisfactory definition of what constitutes hypnosis cannot be framed at present. In some respects it is like defining insanity and presents as much shading as from light to darkness or the union of the spectral colors to form white. Several psychical states are closely allied to the hypnotic, which is generally regarded as a kind of sleep or daze, although the special phenomena are often exhibited in those wide awake. These states vary in degree and from those physiological to those pronounced pathological. Sleep, somnambulism, catalepsy, fright, anxiety, hysteria, hypochondriasis and many other mental states all present, on close inspection, psychical features more or less common to the hypnotic state.

The similarity of symptoms in certain gynecological ailments and the traumatic neuroses has been pointed out by Seguin, and influence of suggestion in these cases has been insisted upon. A consideration of the mental phenomena presented in those psychic epidemics such as the dance of St. John's, St. Vitus and the "tarantism" of the middle ages, and the modern epidemics such as Perkins' tractors, the blue glass mania and our recent christian science with their miraculous cures seem to present as basic features the principles at the foundation of hypnosis.

It is comparatively recent that the relation and similarity of phenomena of the hypnotic condition and the traumatic neuroses has been pointed out. The capability of suggestion to develop and fix symptoms has long been recognized and commented upon by railway surgeons especially, but too often perhaps it has been ascribed to malingering. To such an extent has this been recognized that the name "litigation symptoms" has been given to that group that has so long surrounded "concussion of the spine" like a halo. According to Sepelli, Benjamin Brodie in 1837 described cases of local hysteria from injury, while Russell Reynolds in 1869 called attention to the fact that paralyses of sense and motion might occur as the effect of disturbed imagination.

Most pertinent to our inquiry is the effect of traumatism in inducing a hynotic condition, with its receptivity to suggestion.

Charcot says, speaking of railway injuries, "A peculiar mental condition is often developed which is intimately connected in my judgment with the hypnotic state. In both of these conditions in fact, the mental spontaneity, the will or the judgment is more or less suppressed or obscured and suggestions become easy."

Vibert, who has considered the traumatic neuroses in their medico-legal aspect, says after injury the patient exhibits "a sort of cerebral automatism in which, like a somnambulist, he performs acts unconsciously."

Sepelli, who has given much study to hypnotism and has written an able review of the traumatic neuroses, says: "We must admit that the cerebral state produced by the nervous emotion after a traumatic accident is in a certain measure equivalent to that cerebral state which hypnotic maneuvers determine in hysterical subjects."

Confirmatory of this is the testimony of Thorburn and Page as railway surgeons. Thorburn, as quoted by Page, asserts that "the period of daze following injury is of the same nature as the state of hypnotism," while Page, in his later brochure, "Railway injuries in their medico-legal and clinical aspects," quoting Oppenheim's statement, "The chief role is played by the psychical—the terror, the mental disturbance," says, "The whole sensorium apparently may be thus affected and may pass into a state of slumber, as is shown by mental hebetude, by lessened volitional powers, by anæsthesia and analgesia, and on the other hand by excessive activity of the lower automatic centers from lost or torpid cerebral control. The abnormal condition is allied in all probability to that of hypnotic sleep."

Farther evidence is unnecessary to establish the fact that the condition identical with or akin to hypnosis may result from injury or its environment. The adequacy of the conditions surrounding railway injuries to produce a hypnotic condition of the higher nerve centers and provide at the same time an adequate stimulus or suggestion would seem almost self-evident.

Says Farneaux Jordan: "The principal feature in railway injuries is the combination of the psychical and corporeal elements in the causation of shock in such a manner that the former or psychical element is always present in its most intense or violent form. The incidents of railway accident contribute to form a combination of the most terrible circumstances which it is possible for the mind to conceive. The vastness of the destructive forces, the magnitude of the results, the imminent danger to the lives of numbers of human beings and the hopelessness of escape from the danger give rise to emotions which in themselves are quite sufficient to produce shock or even death itself. All that the most powerful impression on the nervous system can effect is effected in a railway accident and this quite irrespectively of the extent or importance of the bodily injury.

Thomas H. Manley, in his masterly paper "A Consideration of Traumatic Lesions of the Spine Resulting from Railroad and Other Injuries," read before the American Medical association in 1891, seems to minimize the importance of the emotions attendant on railway injuries. In speaking of those ghosts of departed "spinal anæmia and concussion of the spine" he says:

"In the beginning we must be convinced that the emotional state of terrible alarm, trepidation and suspense attendant on a railway injury are different in quality and magnitude from those which must be of frequent occurrence in the carnage of battle, during the firing of heavy guns, explosion of shells and springing of mines; from that borne by the wounded when a whole limb is torn away or when the maimed and crippled, unable to withdraw their mangled and bleeding bodies, are ridden over or trampled on by the columns of advancing cavalry or infantry."

If a criticism of such an able and distinguished surgeon may be allowed from this source I should deny that the cases are in the least analogous, inasmuch as in the soldier's life certain important factors are present that should be taken into consideration. First, in the creation of an army by enlistment the requirements are such that only the able-bodied apply as a rule. Again, the outdoor life of the camp would tend to correct any neuræsthenic or hysteric tendencies, and in addition the military requirements as to routine and drill would soon eradicate it. In fact, outside of the classical cases of Charcot I believe any case of neuræsthenic or hysteria, inherited or acquired, would be promptly cured by some martinet of a drillmaster. Finally, it ignores the highly important factor of the suddenly unexpected. The most evenly balanced nervous system may be startled by the unexpected opening of a door, while the supersensitive and hysterical would be undisturbed if the event was expected. So the daily fortune and expectation of a soldier has fortified his nervous system against the mental shock incident to war. On the contrary, severe railway injuries are received in probably an extremely large proportion of cases by women or those persons who are hysterical, or at least excitable and emotional, and the injury is unsolicited and unexpected.

It has been asserted by several competent authorities that railroad employes are less subject to traumatic neuroses than passengers. If this be true it is undoubtedly due to the fact that railroad employes are fortified by their knowledge of liabliity to injury and daily duties against mental shock. Familiarity with the environment of a railroad life breeds indifference if not contempt. My experience has confirmed my belief that employes are not as a rule liable to mental shock unless predisposed thereto. The coolness and sangfroid with which serious or even fatal injuries are met is indicative of this.

Certain factors predispose to this hypnotic condition. Age has an important bearing. Walton makes this significant statement, after analysis of one hundred consecutive cases, that he has never known this symptom group to occur in persons under seventeen years of age in but one case, at fifteen years. Seguin in commenting on this says, that facts tend to show the importance of auto-suggestion and self-study in the genesis of the traumatic neuroses, inasmuch as children are often injured and are subject to nervous symptoms.

Heredity plays a prominent part. That inherited constitution of the nervous system called unstable, excitable or emotional, has an important bearing in inducing this condition. In one case after a single necessarily hasty examination, I diagnosed malingering. There had been a slight scalp wound which had been neglected and suppurated for some time but finally healed. There were all the subjective symptoms usual to traumatic neuroses, with alleged unusual and unconscious periods, with ebullitions of passion without provocation. Influenced by Oppenheim's teachings I diagnosed malingering from the absence of any anæsthetic areas and the rather overdone picture of emotional outbursts, as described by relatives. However, a reasonable settlement was effected, and after two years these symptoms are alleged to still persist in a greater or less degree. From an industrious man he has become one without ambition or desire to labor, and pleads his injury as an excuse. I have been repeatedly promised examinations, but he has failed to report. Inquiry of a former medical attendant acquainted with the family living at a distance reveals the fact that the family are all peculiar, especially the father, who has been considered by the laity as insane, and that the injured man has been especially eccentric. I doubt not but that his present ailments are pathological conditions resulting from ideas.

Moral training has its influence, whether one is taught to resist the accidents and vicissitudes of life or to yield to them. Previous diseases and all forms of excess, especially of the sexual function, are of importance as inducing neuræsthenia. Overwork, physical or mental, grief or anxiety may be factors to be taken into consideration. One or more of these in connection with a traumatism may produce the hypnotic condition in which suggestions find ready soil.

Page says: "The examination of a patient may therefore provide the suggestion whereby ansæthesia occurs," so that in the differentiation from malingering it is well to conceal from the patient what you are endeavoring to learn.

This condition may or may not be readily detected. It will not present itself usually in the classical forms of Charcot, but there will be that peculiar mental condition where "the mental spontaneity, the will or the judgment is affected and suggestions become easy," as before quoted. Malingering must be differentiated. To effect this repeated examinations will be necessary and a careful consideration of the foregoing factors and an intimate knowledge of his daily life and environment. Suggestions as to anæsthetic or hyperæsthetic areas may in probably many cases be satisfactorily demonstrated, as in a case of fright neurosis of my own, hereinafter noted. I have seen this in a male neuræsthenic, non-traumatic in origin, where a pain or other subjective symptoms could be elicited and persist for hours after suggestion. Given this hypnotic field, plant the seeds of suggestion and you can speedily grow any litigation symptoms desirable. Concentrate the mind on self and the idea of pain or analgesia, convulsion or paralysis may be evolved in these cases.

The following cases illustrate the influence of suggestion in the traumatic neuroses. The first two are selected from the rapidly growing literature, the others occurring in my own practice.

Dana reports the case of a man aged fifty who, having touched a wire fallen from a street lighting apparatus, became unconscious with hemiplegia, hemianalgesia and other hysterical symptoms. Two weeks before he had seen a fatal accident. The wire was a dead one and the man had received no current.

Hodges, in the Boston Medical and Surgical Journal, reports the following:

"A railroad train plunged into the chasm of an open drawbridge, 46 persons losing their lives, some 30 others being more or less severely injured. One car broke in two near the middle, leaving its rear portion on the edge of the abyss, while the front went down. The occupant of the seat where the break occurred was suddenly confronted with the horror of the scene and the sight of his struggling and drowning fellow passengers. He received no bodily injury, but a long contest with nervous symptoms ensued similar to those attributed to concussion of the spinal cord. He was obliged to give up active business, and to the day of his death, many years afterward, was unable to sit except on an air cushion or to bear the jar of riding in any vehicle on wheels."

The following case first directed my attention to the similarity of the traumatic neuroses to the classical concussion of the spine before I had knowledge of any literature bearing on the subject. Although this fact was recognized at the time its importance was unappreciated.

J. J., at 15, unusually strong and previously well, was taken ill with continued fever in May, 1887, which ran a protracted course. During the year previous his parents' residence had burned in the night. He assisted in the removal of the household goods and appeared well after. While convalescent, a neighboring house caught fire, and fears were entertained that the house in which he was situated might take fire. He became greatly excited, relapse occurred, succeeded by an hysterical condition characterized by despondency and apprehension, with emotional outbursts the cause of which he himself did not know. His pulse became exceedingly variable, but always rapid, 120 to 160. There was inability to walk without assistance; marked hyperæsthesia, the slightest touch causing apparently great pain; bowels greatly constipated; no rise of temperature. Tonics and nervines failing to do good in this condition. I was after a time dismissed. I was again called to the case in August, 1889. I found him with an anxious appearance like that of a confirmed invalid. Pale, anæmic, with impaired digestion and bowels constipated, extremities cold. Still exceedingly despondent and emotional, able to move about but easily tired. Finds it impossible to go to certain places owing to nervous attacks, always gets nervous in thinking of these places; reflexes normal, pulse quick and irritable.

I think he presented nearly all the 31 subjective symptoms of spinal concussion as laid down by Clevenger. In the treatment by the induced current I found that by "suggestion" I could determine over given areas disturbances of sensation, even to absence of sensation to the strong ferradic current applied to acne lesions. Anæsthesia over certain regions could be produced at will, so that it was impossible to tell the points of an æsthesiometer. This phenomenon could not always be elicited, but at times was very marked. He improved greatly in a few months, but finally abandoned treatment. I am recently informed by his brother that he "is not right." He seems well and eats heartily, but after working for a few days at light work becomes nervous and refuses to work.

The following case, occurring under my own observation, has an important practical bearing as showing the efficiency of suggestion in evolving symptoms and the importance of isolation in these cases where it can be secured.

A young lad 16 years of age received a comminuted fracture of the left parietal bone in July, 1887, during a collision between two excursion trains. Great excitement ensued, as the accident was in the night and the trains were crowded. The patient received the necessary surgical care, and from the first the family were repeatedly impressed with the necessity of withholding any reference to the accident or his injuries, not only for his immediate recovery, but for his future welfare. They co-operated I believe most heartily with the plan of keeping any suggestions from him. His recovery was apparently perfect with the exception of a slight cerebral hernia. Careful personal observations and inquiry of the family failed to discover any resulting symptoms of note to December, 1889, when a suit for damage was instituted. He began soon to complain of headache and pains through his spine, of dizziness and numbing sensations, and a whole train of subjective symptoms, with peculiar motions, on attempting any task; the cause of or necessity for such motions could not explain. Repeated examinations failed to show any objective signs other than the hernia. Personally I was satisfied that the boy was no malingerer. He was frank in his statements that he was previously entirely well, had never felt any symptoms save weakness when he first got up and had had an occasional slight headache, probably no more than before injury. The sudden onset of the symptoms after the suit and his confession that this was the fact seemed not the work of a malingerer.

With the final settlement of the case the symptoms disappeared, Since the commencement of this paper, in a conversation with the attorney for the boy, upon inquiry I find that no symptoms were present or had been observed by the parents, as they themselves stated, save a little unusual irritability until after examination by experts and the lawyers. The symptoms developed soon after. The attorney also stated that he formed the same opinion as myself, that the boy was honest in his assertions and was no malingerer.

A little consideration of the circumstances surrounding this case enables us to comprehend it. After injury he is informed there is no danger and every effort is directed by all interested to convince him that his recovery will be perfect. Suddenly he finds the importance of his injuries has increased from a financial standpoint to the tune of $20,000. A careful scrutiny not only of the present but of the past is made to discover symptoms. He is told to look for them, his parents, brothers and sisters look for them. Experts examine him. Lawyers question him. Is it any wonder that, with such a system of auto-inspection and espionage, a condition should be established wherein the "mental spontaneity, the will or the judgment is more or less suppressed or obscured," and that the sensory or motor system should for a time be ruled by ideas?

I believe with the modern views on this subject a greater importance will be attached to this doctrine of hypnotic suggestion in the future and that it will eventually come up in the courts. That a reaction is setting in outside of those whose specialty is surgery, is evident to any one who attempts to keep pace with the growing literature of the subject. Already it has found a place in the text books. Osler's new practice says of the traumatic neuroses:

"A majority of the patients with traumatic hysteria recover. In railway cases so long as litigation is pending and the patient is in the hands of lawyers, the symptoms usually persist. Settlement is often the starting point of a speedy and perfect recovery."

I believe that it will eventually be found that a large majority of those cases which have no organic lesion, if taken early, can be cured by the application of the principles laid down by Wier Mitchell—rest, massage and after a time forced feeding.

I will merely point out in passing that this doctrine reconciles in great part the opposing views of surgeons in these cases that with the acceptance of the theory of hypnotic suggestion they can meet on common ground, without being regarded one as the tool of a corporation, the other as preparing a case for a prospective fee. It also explains the peculiar efficacy of the "golden cure," without throwing the comparatively few honest people in with the perjurers.

The following are I believe practical deductions more or less dependent on the foregoing:

1. That hypnotic suggestion affords the only rational explanation of the shifting, contradictory and over prominent subjective symptoms of the traumatic neuroses.

2. That severe railway injuries and their environment peculiarly provide the factors for inducing an hypnotic state.

3. Where practicable all severely injured persons, particularly in railway accidents, should be isolated and kept free from suggestion and undue sympathy. This is best accomplished in a hospital.

4. With proper isolation, forced rest, with massage and full diet the majority of cases of traumatic neuroses would be cured.

5. The traumatic neuroses should be carefully differentiated from malingering.

6. To establish a differential diagnosis repeated examinations are necessary.

* * *

CHAPTER VI.

MEDICO-LEGAL QUESTIONS.

Legal Points for Railway Surgeons.

[H. B. Tanner, M. D., Kaukauna, Wis.]

The railroad surgeon, by virtue of his position as an employe of a great corporation, sustains a relation to the law courts somewhat different than that of the ordinary surgeon. In these days of ready resort to law for every injury or fancied wrong by those who use the railway either as passenger, employe or trespasser, the railroad surgeon is very liable to play an important part in the case. The relation sustained by the railway surgeon to the law courts may be that of an expert for or against the company, or as a witness of the injury sought to be established, or possibly a co-defendant with the railroad company against a suit for negligence.

Suits for damages had so often been sustained by the courts where the railroad company had not the support of a competent surgeon to testify as to the actual condition of the patient at the time of the injury that some companies began employing surgeons who would be at their command at all times, and upon whom they could rely to look after the interests of the company. This system has grown to such an extent that now all of the progressive corporations have a regular staff of surgeons located at convenient points, who can be counted on at all times to give immediate and specially trained assistance to those who may be so unfortunate as to receive injury at the hands of the company.

This attention on the part of the company serves two purposes; in the first place it impresses the employes that the company is ever ready to look after their welfare, particularly at so trying a time as when suffering from injury. This constant watchfulness has a tendency to break down the barriers existing between capital and labor, and helps dissipate the notion that railways are soulless corporations. An injured person receiving the constant and skillful attention of a faithful railway surgeon, without expense to himself, hesitates about beginning an action for damages against such a company.

In the second place, the immediate report of the surgeon in attendance furnishes the officers a correct account of the extent of the injury and the manner in which it was received. This is often of the greatest moment to the officers in the question of settlement in case of negligence.

In reporting upon existing injuries the surgeon should carefully examine for all previous injuries; what disability or deformity if any did the injured person have which existed previous to the injury? was he a government pensioner, and if so for what disability? An acute disabling injury frequently aggravates a pre-existing disease, and this may be the basis for damages where the company should have no liability whatsoever. To illustrate this point I will quote two cases:

Mr. C. F. H., night foreman switch yards, about 3 a. m., Oct. 4, caught his heel in a guard rail and was thrown outward, falling across a parallel rail. He suffered from a compound fracture of the os calcis of the left foot, a laceration along the anterior surface of the left leg, eight inches long, penetrating to the tibia, and a simple fracture of the right femur near the middle of the bone. No other injury manifest. The laceration was sewed up, the wound in the heel enlarged and thoroughly washed out with bichloride solution, and both wounds dressed with corrosive sublimate gauze and bandage. The fracture was put in side splints with Buck's extension apparatus.

The wounds were dressed the 6th inst., and on the morning of the 8th everything was progressing nicely, with no pus or inflammatory action and but little pain. About noon the patient appeared tired and went to sleep. About 4 p. m., not being able to awaken him, his nurse became alarmed and sent for me. I found him unconscious, breathing rapidly, pulse rapid and weak, pupils dilated moderately and responding to light, and he would respond to pain produced by pinching his arms. The urine was found to have a specific gravity of 1030 and to be loaded with sugar. He continued in this condition until 9 p. m., when he died. It was then learned that he had been under treatment by a physician of a neighboring city for six months for diabetes. He was also blind in one eye, having lost sight during childhood. His widow threatens suit on the grounds that her husband received fatal injuries while in the employ of the railway company, due to their negligence. The injuries he received were not necessarily fatal, and had he not been afflicted with a dangerous disease he would probably have recovered in due time. This case indicates that trainmasters should exercise more care in employing men who are physically disabled. For instance, a man with one eye is not properly qualified to perform the duties of switchman, at night in particular.

The legal points are often not appreciated in reporting an injury. The record of another case will show the importance of ascertaining the exact condition previous to the injury.

E. L., an engineer, drawing a pension from the United States government for a gunshot wound of the left leg, applied in June, 1890, for an increase. The pension board recommended that he receive a total disability rating, $30 a month for gunshot wound of the left leg, also $6 per month for hemorrhoids. July 24, 1890, he sustained a simple fracture of the left leg during a head-end collision.

The fracture healed kindly, and he was in no worse condition apparently than previous to the accident, but through the advice and assistance of certain medical and legal experts be obtained, after a law suit, a judgment against the railroad company for $7,000.

To protect themselves against cases of this character, in addition to the examination for color blindness, I believe all railway companies will be obliged to subject every applicant to a thorough physical examination before allowing him to hold any responsible position in their employ.

Another case will show how near a railway company came to suffer loss at the hands of a jury owing to the negligence of an incompetent physician.

This company did not have a surgical service, but trusted their employes to the first man to arrive. J. K. fell from a scaffold while at work about the shops and received a sprained ankle and wrenched back. The pain was so great that the physician who was called gave one-third of a grain of morphine by hypodermic injection; this rather large dose produced retention of urine; the urine was drawn the next day by a catheter. On the third day following the patient developed chills and cystitis, from which he recovered after a protracted illness.

He sued the company, alleging injuries that produced kidney disease. On cross examination it was drawn out that the physician had taken a catheter from his pocket case, one that he had carried for some time and used occasionally, and had without disinfecting the same introduced it into the bladder, without doubt carrying septic germs in that produced cystitis. Great stress was laid by the attorney on the color and quantity of water passed by his client. This urine on examination showed nothing abnormal. As the claimant sometime after the accident opened a saloon the temptation for the free consumption of beer might have a tendency to increase the quantity of urine. At least this was undoubtedly the view the jury took of the case, for they brought in a verdict acquitting the railway of negligence.

This jury reminds me of a story told by a New York reporter. While interviewing a distinguished English visitor he was asked why it was that so many American cities were complaining of bad water, as he understood the water supply was under the direction of the city officials, and those officials were elected by the people. "Yes," says the reporter, "that is true." "Well, then, it appears to me that you have not been careful to elect officials who are good judges of water." This jury was evidently a good judge of water—or beer.

I cannot leave this question of legal points without making mention of a class of medical experts who sell themselves to speculative lawyers, and enter into conspiracies to rob corporations through suits for damages. They furnish a finely spun, delicately woven web of theory to fit the case, usually naming some obscure internal malady alleged to have been caused by a railway accident.

This practice of securing the testimony of experts, especially in railway damage suits, has gone to such an extravagant extent of late years that it has really become a profitable profession in itself to act as an expert witness at the command and in the interest of any party who will offer a sufficiently great inducement. These medical speculators usually charge an exorbiant fee, or as stated by a prominent Chicago physician, get a portion of the prospective judgment assigned to them in advance, thus destroying any real value in their testimony as unbiased experts. One of these experts, Dr. H. N. Moyer of Chicago, in an article on medical jurisprudence, published in *The Railway Age* for Feb. 7, 1892, says that "in this class of cases the railway surgeon seems to be woefully deficient, and when one of these surgeons has a deliverance upon spinal concussion, is it a matter for wonder that the medical world is not impressed?" He also says, as far as his own experience extends, he has never met a railway surgeon at one of these examinations who was provided with an ophthalmoscope or an electric battery. Nor has he ever seen a complete examination made by a railway surgeon even when every opportunity was given.

This sharp criticism I believe is untrue, and it is certainly unjust. The very fact that the National Association of Railway Surgeons can show a membership of over 1,200, and the presence of this assembly here to-day, many coming more than a thousand miles to participate in the discussion of subjects pertaining to railway surgery, is sufficient to refute the charge of general incompetency among railway surgeons. Vaunted and venal expertness is usually worthless as evidence, and yet such testimony is getting to be in great demand.

This practice of bringing speculative law suits against corporations has assumed such great proportions that it has become a serious burden to many railroads. The profession should denounce any member who so far lowers the dignity of his calling as to sell his testimony for a share of the prospective judgment. In many jurisdictions the practice of champerty—which is defined as "a maintenance of any man in his suit upon condition of having part of the thing if recovered"—is sufficient grounds to disbar a lawyer, and such practice in a physician should put him out of the pale of good society.

As railway surgeons we are frequently called upon to testify as to facts and in many cases we have put to us hypothetical questions difficult to answer positively yes or no. At such times the courts should allow the surgeon to explain fully his answer or take it as his opinion only, remembering that every case is decided upon the greater or less probability, so that there may be a chance for error, not only in the testimony but in the tribunal itself.

These so-called experts have no hesitancy whatever in giving evidence of the possibility of disease resulting from the slightest of injuries, if there is a prospect of a good slice of the resulting judgment in view, where the more honest physician, knowing that medicine is not yet that exact science that these cunning men would have the jury believe, would care to state facts only.

As railway surgeons and members of the medical profession in general we should use our influence to bring about a change. Instead of the lawyer going from office to office stating his case and taking the physician as witness who gives an opinion that agrees with his side of the case, the courts should call to their assistance, when needed, one or more unbiased medical men of sufficient learning and experience that they may give the judge and jury an impartial statement of the physical condition of the claimant. In this way we shall be able to obtain the judicial utterances of science as to vexed issues of facts, instead of the interested arguments of experts who are virtually employed as counsel by the party calling them, or the wild utterances of philosophic monomaniacs who are called simply because of their absorption in some unique theory of their special invention.

Death from Shock—From a Medico-Legal Standpoint.

[By O. D. Fitzgerald, M. D., Los Angeles, Cal.]

My object in selecting the above subject for this occasion was to direct attention to certain forms of shock communicated to the nervous system rather than injuries directly inflicted upon the body, externally or internally, and to endeavor to trace the source of the alarming symptoms or conditions often manifested in these peculiar instances which we observe in persons who have been only slightly injured in an accident.

These concussions or shocks not infrequently occur in ordinary accidents of civil life, but in none more frequently or with more severity than in those which are sustained by persons who have been subjected to a violent shock by a railway collision, and it is to this particular class of cases that I am especially desirous of calling your attention. For not only have they, in consequence of the extension of railway traffic, become of late years of very frequent occurrence, but often in the absence of evidence of direct bodily injury there have been instances wherein pesons have thus died from shock and the question of damage coming up, the injustice of attaching any liability to the railway company should have been established. Instances will be cited further on which it is thought will show to all fair minded men that a claim for that character of damage, resulting as it often does from fear, terror, dismay or other depressing influences, should not be entertained in our courts of law. All, I think, will agree that in a certain small proportion of such cases the claims for damages set up by the plaintiff against the railway company for death resulting from shock can not be justly allowed.

There is no class of cases in which surgeons are now so frequently called into the witness box in courts of law as that for the determination of the many intricate questions that arise in actions for damages against railway companies for such injuries, alleged to have been sustained by persons in collisions on their line, and there is no class of cases in which more discrepancy of surgical opinion is elicited than in these. It is with the view and in the hope of clearing up some of the more obscure points connected with these injuries that I have brought this subject before this association at this time. That discrepancy of opinion as to the relations existing between apparent cause and alleged effect as to the significance and particular symptoms, in this as well as in other affections, and as to the probable result in any given case, must always exist there can be no doubt, more especially where the assigned cause of the evil appears to be trivial, and for the existence of this discrepancy of opinion and for the expression of it, if necessary on oath as a matter of opinion merely, a very unfair amount of blame has been cast on members of the medical profession.

In well marked and clearly defined cases of injury where the lesion is manifest and distinct, as fractures or extensive contusions or crushing of important parts, no discrepancy of opinion can or ever does exist. I have no hesitation in saying that in at least forty-nine fiftieths of all the railway or other accidents that are referred to surgeons of experience for arbitration or opinion (and by the way, parenthetically, I will say that medical men are the only competent class from which to select a jury for trial of all such cases) there is no serious difference as to the real nature of the injury sustained or as to its probable result on the patient either locally or constitutionally, immediately or remotely. But in a certain small percentage of cases the resolution between alleged cause an apparent effect may not always be easy to establish. And occasionally among this exceptional class is found an instance where death has resulted directly from shock, and life had been destroyed without there being any post-mortem evidence to account for the speedy result. On several occasions, according to Taylor, Whorton, Ashhurst and others, persons have died in railway collisions from no physicial injury, but from pure shock alone. Taylor says that in a collision which took place in 1872 at Durham station, England, a Mrs. Coble was among the dead, and on a post mortem examination there was no appearance of external or internal violence.

Savory ("Lecture on life and death," page 171), has suggested that death from shock is nothing more than death "from temporary exhaustion of nerve force, the result of the violent, sudden and excessive expenditure of it."

Ashhurst says: "Originally employed in any case of sudden death or collapse following injury or mental emotion without discoverable lesion, the term shock has, step by step, with the increase in knowledge of physiology and the extension of experimental inquiry, become more and more definitely associated with the conception of a sudden check to the circulation brought about through the agency of the nervous system, and resulting in death either so immediate as scarcely to have a parallel, or in a condition of prolonged prostration, with or without a more or less successful re-action. Long ago Travers pointed out that frequent instances of sudden death consequent upon injuries which left no trace of their destructive operation upon the texture of the vital organs, and other instances of death after the lapse of a few hours or days and some even weeks from the reception of the injury, admitted of no other explanation according in any degree with the history and symptoms of the malady than a suspension or failure of the nervous power." Nor is it less clearly proved by the spontaneous disappearance of all symptoms in case of recovery, it being so rapid that there can be associated with it no serious structural lesion.

With regard to causes of shock there can be no doubt that mental emotion, especially joy or fear, of itself, without bodily hurt of any kind, may be followed by the gravest form of shock, resulting in immediate death, even where there is no probability of organic disease of the heart. In the oft related case of a janitor of a certain college who had rendered himself in some way obnoxious to the students you remember how they determined to punish him, and so, conveying him to a lonely place, proceeded to pass sentence upon the poor follow. Seeing the preparations that had been made he at first tried to treat the whole thing as a joke, but was told to prepare for the execution, for they were going to behead him "then to there." They therefore blindfolded him, he was made to kneel before the block, the order was given, the axe was raised, but instead of the sharp edge, a wet towel was brought smartly down on the back of the culprit's neck. Thinking they had freightened the janitor sufficiently they took off the hoodwink and to their astonishment he was dead.

No two persons, however, are effected alike by shock or to the same degree; some are but slightly moved, others are influenced in the most serious manner. Others again are greatly disturbed by slight accidents of a special kind while they are altogether heedless of troubles much more grave. Yet sometimes when the temperament and nervous susceptibility of a patient are well known a prediction may be hazarded as to the probable effect of any injury or an operation, and timely help be thus gained in the matter of prognosis and prophylaxis.

I know not that this subject has ever been mooted before in medical associations, but it is admitted that certain instances, a few it may be, have occurred where a person defectively "strung up" in his nervous and circulatory system—a person below the average in these respects—having been in a railway collision has died from shock without any marks of injury being discovered on his body post mortem. Let us suppose that at same time and place of this accident a fellow passenger was severely crushed and to all appearances fatally injured. His suffering was intense and word was passed from one to another that this man was doomed. But in spite of the graveness of his injuries and his discouraging condition he finally recovers. I appeal to you if this has not been the experience of many surgeons in such cases. The one dies from shock alone. The other whom you fully expected to die gets well.

The question of practical importance aimed at in this article is simply this: should a railway company be held for damages in case of death from shock where it had been proven that the party prior to the accident had been known to be of unsound physical development as regards the nervous or circulatory system, and this unsound condition contributed or predisposed to and rendered him thereby unequal to the consequent mental emotion? Would it be fair and just to exact the same amount as damagês, if any at all, for the death which resulted from shock as above stated, that would be demanded in case of the man whose death had undoubtedly resulted from bodily injuries received in the collison? It is fair to assume that had this person been of strong nervous development and with a normal circulation a trivial or unimportant wound would not according to the common observation and experience in recent experiments in physiology have resulted fatally. I cite the following case, which was reported in *The Railway Age* February 19, 1892. The syllabus reads as follows:

> **Permanent injury to the nervous system resulting from fear caused by a collision on defendant's road, due to defendant's negligence, in consequence of which the cars were thrown against the plaintiff's dwelling house, in which she then was, will not support a cause of action; the permanent injury is not the natural result of negligence complained of.**

Continuing, the court says: "It is plain from the plaintiff's statement of her case that her only injury proceeded from fright, alarm, fear and nervous excitement and distress. There was no allegation that she had received any bodily injury. If mere fright unaccompanied by bodily injury is a cause of action the scope of what are known as accident cases would be greatly enlarged. For in every case of collision on a railroad the passengers, although they may have sustained no bodily harm, will have a cause of action against the company for the 'fright' to which they have been subjected." This is a step beyond any decision of any legal tribunal of which we have knowledge. What duty did the company owe this plaintiff ? It owed her the duty not to injure her person by force or violence; in other words not to do that which if committed by an individual would amount to an assault upon her person. but it owed her no duty to protect her from fright. (Sup. C. Pa. Ewing vs. Pitts. Cin. Chi. & St. L. R. Co. 1 Adv. R., Leg. Intel., 78.)

The following is case of Pullman Car Company vs. Baker, Colo. Vol. 4, page 344. The syllabus is as follows:

> **1. While the law exacts from carriers of passengers the utmost care and skill it refuses to take into consideration damages remotely resulting from a breach of their contract or neglect of their duty. The maxim is "Causa proxima, non remota spectatur."**
>
> **2. Where the plaintiff, a woman, was a passenger on a sleeping car of the defendant, which through the negligence of the defendant caught fire and the plaintiff, on account of**

smoke and flames, was compelled, in a half-clad condition, to leave the car and caught cold which resulted in the suppression of her menses and subsequent illness, it appearing from the evidence that such illness was of the character that results from arrested menstruation, held, that the plaintiff being "unwell" at the time there was in her then physical condition an intermediate and independent cause of the subsequent illness which was the remote and not the proximate result of defendant's negligence.

3. Persons who are ill have a right to enter and travel in the cars of a railroad company, and as common carriers of passengers the company has no right to prevent them, but the increased risk arising from conditions of health affecting their fitness to travel, certainly where such conditions are unknown to the carriers, must be assumed by the passenger.

In cases of contact as well as tort, where no question arises of fraud, malice or oppression, the loss or injury for which compensation is sought must be the natural and proximate consequence of the alleged breach or wrongful act. Cit. Sedgwick's Measure of Dam. 57, et seq. Also Sherman and Redfield on Neg. page 595 et. seq.

What is the proximate cause of an injury in a legal sense is often an embarrassing question, involved in metaphysical distinctions and subtleties difficult of satisfactory application in the varied and practical affairs of life.

The proximateness required is not the greatest possible; the negligence to which the responsibility attaches may sometimes occur with, or precede, other agencies in producing an injury. A result may be physically secondary and consequential, and yet in legal contemplation be proximate. See Col. Report, Vol. 4, page 345. As a consequence, the rule is vague and difficult of application. As said by Bracewell, "it is sometimes like having to draw a line between night and day; there is a duration of twilight when it is neither night nor day."

Each case of this character must be decided with reference to the circumstances peculiar to it.

In determining whether an act is the approximate cause of an injury the legal test is: was the injury of such a character as might reasonably have been foreseen or expected as the natural result of the act complained of?

A party is not in law chargeable with results which do not naturally and reasonably follow as the consequences of his conduct. Sackett's Inst. to Juries, page 274.

In determining the proximate cause of death in case of shock, the jury, I think, should consider whether the causes which actually produced the death were such as naturally resulted as a consequence of the slight, or possibly not perceptible, injury inflicted at time of accident, and of such kind as might have been reasonably anticipated, by a reasonable person. If they were not such, then the slight or no injury can not in law be regarded as the immediate and proximate cause of death.

As a matter of law, damages to be reasonable must be the natural and reasonable result of the defendant's act; and if of such a character as in the ordinary course of things would flow from the act, they may be recovered; otherwise they are too remote. Sackett, page 275.

A party cannot be held responsible for injuries which could not reasonably have been forseen or expected as the result of his misconduct or of the collision. An act is the proximate cause of an event only when, in the natural course of things and under the particular circumstances surrounding it, such an act would naturally produce the event, and in order to create legal liability for damages the injury must be such as a man of ordinary experience and sagacity could forsee might probably ensue from said act. Sackett, page 275.

The proximate cause of death from shock is one of those metaphysical questions difficult of satisfactory adjustment. It can not be claimed that the terror of mental excitement, or even the slight bodily injury, consequent upon the collision or other accident, was the proximate cause of death, and the proper conclusion to arrive at, in such cases, I have thought is this: The cars of a railroad company are not hospitals, nor are their employes nurses.

I thank you for the patience shown me, and in conclusion will say: Criticise the paper, but pray don't be quite so caustic as on a certain occasion, when the French Academy was compiling its famous dictionary, some one experimentally defined a crab as "a small red fish, that walks backward." Cuvier, on being appealed to, assented to the correctness of the definition, remarking however these exceptions: that "it is not a fish, it is not red, and it does not walk backward."

Shock in Railway Injuries and the Fatality of Too Early Operation.

[By Surgeon R. L. Payne, Jr., Lexington, N. C.]

I appeal to your attention to-day. not because I have anything new to present to your notice, but because it is wise oftimes to go back to first principles and to keep in mind the simplest laws. It is not my purpose to discuss what shock is, since there seems to be a general consensus of opinion that shock is "a condition of collapse resulting from physical injury or mental emotion (one or both), whereby the functions of the nerve centers are more or less completely suspended."

All are familiar with the phenomena of shock The obtunded consciousness, the impaired sensibility, the loss of volition, the deadly pallor, the slow, feeble, gasping, sighing respiration, the small fluttering pulse and the cold extremities bathed in a clammy sweat make up a picture that once seen is so impressed upon the mind of the surgeon as not to be easily effaced. It is not to these points, then, that I wish to call your attention, for to us they are all familiar; but to the railroad surgeon shock has a greater interest than to those engaged in other lines of practice, for in railway injuries shock is more profound than in any other class of wounds; the patient often quickly dies from the sudden inhibition of all nerve power; and, if reaction occurs it is often very slow, twelve, twenty-four or even forty-eight hours elapsing before it is fully established, the system frequently faltering in the interval even under the sustained employment of the most powerful stimulants.

The practical points, then, to us, are how should shock in railway injuries be treated and when is the time for operation. The first thing to be done for a patient laboring under shock is to place the injured part in a easy position so that no pain, that can possible be avoided, may serve to increase the already existing depression. Absolute quiet should be secured, the patient being secluded from the curious crowd so constantly present on such occasions, and every effort made to reassure the mind and allay the fears of the poor unfortunate when reason once more begins to assume her sway. To my mind this is one of the most important duties of the surgeon, for the state of mind has much to do both with the severity and the perpetuation of the state of shock, and when we realize all the succession of horrors that hang about a railway accident, we can not fail to appreciate the full importance on this part of our treatment. The patient should be covered with blankets to prevent radiation, and efforts should be made to maintain the body heat by keeping a warm atmosphere about his body. This is best accomplished by placing hot water bags, bottles of hot water, hot irons, bricks, or anything else that may be conveniently at hand, under the covers near the body, especially as near the spinal column as may be, in order that the struggling spark of life in the nerve centers may be fostered; but care must be taken not to burn the body of an unconscious patient.

Next in importance is judicious stimulation of the flagging nerve centers, and just here arises the question what is judicious stimulation, for I believe much harm is often done by constantly filling the patient's stomach with large draughts of whiskey or other alcoholic beverages. The experiments of Goltz seem to indicate very conclusively that in shock there exists a paralytic distention of the great veins, and hence our efforts must be directed to a stimulation of the vaso-motor nerves and ganglionic centers. We are to remember, however, that in grave cases of shock the functions of the cardiac ganglia are almost suspended, and too free and hurried stimulation may lead to complete paralysis rather than to increased vigor. First on the list of stimulants stands alcohol in its various forms, and these must be administered in small, frequently repeated doses by the mouth and in urgent cases hypodermically also. In giving brandy or whiskey per orem the best results are to be obtained by small doses given undiluted. Much harm is often done by the administration of large draughts of cold water and whiskey when the circulation is already so enfeebled that absorption can only take place very slowly and in the meanwhile the large supply of cold fluid in the stomach can but add to the existing shock. The best results will acrue from the use of undiluted brandy or whiskey, for we are to remember that as an immediate stimulant much of the effect of alcohol is due to a reflex effect upon the heart through the nerves of the mouth, the œsophagus and the stomach, and hence is obtained long before absorption can occur.

The hypodermic use of alcohol is no doubt best in extreme cases of shock, but the injections should only be made in the warmest portions of the body where the circulation is most active and absorption will most quickly take place. One word of caution is necessary here, and that is, not more than two injections should be made at the same spot. Just here I recall a case of railway injury in which the attending surgeon having once inserted his needle simply detached the barrel of his syringe, refilled it with brandy and again injected at the same point. This he repeated time and time again, injecting so large a quantity at the same spot as to cut off the circulation from the skin over several square inches. This procedure was followed by extensive sloughing of skin and cellular tissue, requiring months of tedious care to restore the parts.

The cautious inhalation of ammonia is exceedingly useful in cases of shock. Lauder Brunton has shown that the inhalation of ammonia will increase the blood pressure very materially. This occurs through reflex stimulation of the vaso-motor center, but is a means of restoration which must be handled with care, since when inhaled suddenly in quantity it may cause arrest of respiration through irritation of the nasal branches of the fifth pair of nerves. Atropia in doses of 1-30 grain hypodermically, *not often repeated*, is useful in hastening reaction, when one or two doses of strychnia (1-40 grain) will not only aid in restoring the functions of the ganglionic centers but following its administration there is less tendency to faltering efforts at reaction. In other words, the stimulating effects of strychnia on the nerve centers is more durable than the effect of the diffusible stimulants, and in all cases of a severe shock the use of strychnia should be combined with that of brandy or whiskey.

Do not do too much. Remember that time and physiological rest are important factors in the treatment of shock, and there is danger on the one hand of overwhelming the already paretic ganglionic centers with the very remedies which, being judiciously used, may stimulate; or on the other hand, there is a possibility of bringing about over action with consequent damage to the injured part and the general system.

As to the time when operation, amputation, etc., should be done, there has been much discussion, and I believe the recognized teaching on this subject has led to much loss of life at the hands of inexperienced surgeons. In general terms all are agreed that operative interference should be delayed until reaction from shock is well advanced, except in cases of otherwise uncontrollable hemorrhage or when the shock is perpetuated by some continuing cause. To this rule exceptions are laid down and in the exceptions lies the danger. Ashhurst writes: "In some instances * * * especially in cases of compound fracture produced by railroad or machinery, the mangled limb seems by its presence to act as a continual source of depression," and in such cases advises prompt amputation. Bryant, as quoted by a recent writer, formulates the rule that "in the presence of severe shock from slight injury, an operation may be done; but in severe shock from severe injury, it should not be ventured."

In the past few years it has been my ill fortune to know of a number of deaths following immediately upon amputation for railway and other accidents, and I have been forced to believe that in several of these instances the fatal result was hastened if not positively determined by premature operation. Not long since a man was run over by a train of cars, crushing both limbs below the knees. The patient was at once carried into a house near by and as soon as his slight existing consciousness could be overcome with chloroform, both limbs were amputated just above the knees. In less than an hour after the reception of the injury, the operation was completed. It needs not that I tell the quickly fatal results. Consciousness never returned; and when I remonstrated with the surgeon he told me he operated to anticipate shock, that we were taught that there were cases of delayed shock in which immediate operation was advisable, and that Gross taught the knife would often act "as a salutary stimulus, favoring reaction." Grand old Gross! What a perversion of thy teachings.

In another instance of severe injury of the internal organs, the fingers were crushed, and a young surgeon, "zealous of good works," though there was excessive shock, proceeded to amputate the fingers. The operation was a bloodless one, for the patient was moribund. This surgeon was a Bryant man, and overlooking the probability of severe internal injuries, amputated under the rule: "In the presence of severe shock from slight injury an operation may be done."

In another instance, a man had both legs crushed in a railway accident. Shock was extreme, and efforts were made to bring about reaction for ten or twelve hours without avail, when a double amputation was done with a quickly fatal ending. This surgeon was an Ashhurst man, and believed the presence of the mangled limb acted as a continuing source of depression, and so proceeded to pile Ossa on Pelion—shock upon shock—with the inevitable result.

These cases and others of a similar character which have come under my observation lead me to think there are fallacies lurking in the teaching of this subject which are responsible for much of death-dealing practice. The only safe rule, especially for the inexperienced, is: "Postpone operation till reaction be fairly established." In cases of severe shock from apparent slight injury let the inference always be "There is some severe internal injury that I have not yet discovered which is causing this shock," and therefore let operation be delayed till reaction comes on. It is better that the patient should die of the primary shock than that his danger should be increased by the depressing effects of an anæsthetic and the added shock of an operation. In all cases of severe shock we should also remember that the system often makes faltering efforts at reaction, only to quickly relapse into the former depressed condition, and in such cases too great a hurry to operate would certainly aggravate the existing trouble.

Recently a man was brought into one of our largest hospitals having had both legs crushed by a railway car about two hours previously. He was laboring under profound shock, but restoratives were used, and in about half an hour signs of beginning reaction appearing, the surgeon, an operator and teacher of large experience, in the presence of a large class of medical students, proceeded, with the help of an assistant, to do a double synchronous amputation. The operation was a brilliant success, and the students were no doubt impressed with the teaching and skill of the operator, but then what the teacher called "secondary shock" came on, and for hours the life of the patient hung in the balance and was only saved by the most strenuous and continuous effort. One can not help thinking the "secondary shock" of the operator was only the added shock of an operation done before reaction was sufficiently advanced, and unfortunately this operation was done in the presence of students, most of whom will no doubt think there is little use in waiting more than two or three hours after the gravest injury before an operation may be done, and very few of them will know anything of the grave risks in this instance added to the patient's chances of recovery.

In conclusion then, permit me to say, when we are called to cases of railway or indeed any other accidental injury the proper thing to do is as quickly as possible to dress the injured part with strict antiseptic precautions. Observe as much care in dressing the wounded parts as you would in dressing an operative wound if this be possible under existing circumstances, and then, placing the part at rest, await reaction before further interference. If there be uncontrollable hemorrhage of course immediate operation may be unavoidable, but all other exceptions to this rule must be regarded as unsafe except in the hands of large experience.

CHAPTER VII.

INJURIES OF THE EYES AND DEFECTS OF THE VISION.

Injuries of the Eye Among Railway Employes.

[By Joseph A. White, A. M., M. D.]

Injuries of the eye among railway employes do not differ from similar injuries among persons engaged in other occupations any more than railway surgery differs from general surgery among other classes of the population. But on account of their special exposure to eye injuries, apparently of the most trivial nature, and which frequently from lack of proper attention cause serious trouble and even loss of sight, the subject is of sufficient importance to call for a few remarks. It may seem *e. g.* a puerile affair for a body of medical men like those here assembled to discuss such a simple matter as "cinders in the eye," and yet I have seen eyes lost more than once as the result of such trivial accident.

The constant exposure of all linemen and trainmen to irritation, abrasions, burns and ulcers of the cornea from the impact of hot cinders is worthy of more serious consideration than is usually given to it. Any one of us who has ever had a cinder in the conjunctival sac when traveling on the rail knows the excessive annoyance and often acute pain accompanying the presence of the little pest and what relief follows the removal. If so much irritation can result from such a little foreign body under the lid, how much more damage could result from its impaction in the corneal tissue?

If it strikes the eye when hot, and it nearly always does, it burns a lodgment for itself more or less deep according to its temperature and its rapidity of motion, and is not so easy to remove, frequently requiring a practiced hand. I have often seen cases where small particles of iron slag contained in the coal used in firing engines struck the cornea with such force as to penetrate nearly through its entire thickness, and that it can even penetrate entirely through and into the interior of the eye is proven by the clinical history of the following case:

Tunis Swats of Hinton, W. Va., engine driver on the Chesapeake & Ohio railroad came to my office on February 7, 1879. The right was red, tender to pressure, phthisical, shrunken, and without perception of light: the left eye had only perception of shadows. The cornea was dotted, aqueous slightly clouded, iris inflamed and vitreous so opaque that the ophthalmoscope gave only a grayish pink reflex. He said his right eye had begun in the same way six months before, without conscious injury of any kind, and has gradually gone to complete blindness and atrophy. My diagnosis from the appearance and history was serous choroido-iritis followed by sympathetic serous choroido-iritis in the other eye. I told him I was satisfied there was a foreign body in the eye causing the trouble, but he insisted he never had any injury of any kind, and if there was anything in it, it was only a cinder, which entered in running his engine.

I enucleated the right eye, and by energetic treatment, salivation, iod. potass. and tonics, with seton in temple and paracentesis, the left eye began to improve, and was gradually restored to a vision of 20-50, leaving some floating opacities in the vitreous. The enucleated eye was dropped into Muller's fluid, and when he was about to return home he asked me for it. I gave it to him, neglecting to examine it. In May he wrote me word that he was all right and running an engine. In July he returned to me for an artifical eye. Found some vitreous opacities present. On December 9 following he came back, this time with his eye nearly blind again. Vision only 8-200, reads No. 20 at one foot; eye red; tension 1. Could not make out fundus. Another attack of serious choroiditis.

Put him on iod. potass. and bichlor. hydrarg. with iron. On the 10th of December gave him 1-6 gr. pilocarpine hypodermically; same on the 11th and 12th. On the 13th and 14th 1-4 gr.; on the 15th and 16th 1-3 gr.; on the 17th 1-2 gr. This was continued until the 21st, when his vision was improved to 20-100. On January 9 it was 20-60, and he could read No. 2 Jaeger. He this time brought back the eye, which he had kept carefully, and asked me to examine it. This I did, and found as I expected a tiny piece of iron slag not larger than a so-called cinder in the vitreous. How it got into the eye or where it entered he could not tell me, having no recollection of such an injury, and the eye was so shriveled that I did not discover the cicatrix.

He returned to his business with a fairly good eye, some few opacities of vitreous and some atrophic spots in the periphery of the choroid. July, 1880, some six months later, he returned again with decreasing vision. Iris slightly tremulous as if zonula was relaxed and the lens was clouding, having a whitish gray center and mother-of-pearl striæ; the cataract being the result of the choroidal and vitreous changes.

I saw him again in July, 1883, and the cataract had not yet matured. In 1887 the cataract being ripe I extracted it with a brilliant result, and to-day he has a good eye with perfect distant and reading vision.

Now in this case there are several reasons for supposing the whole damage was due to the apparently trivial accident of "getting a cinder in the eye." He had never been exposed to the danger of injury of the eye except on his engine; no accident had happened to his engine machinery that would cause chipping of iron particles, and he was perfectly unconscious of ever receiving an injury of any kind. The only explanation was that the little piece of iron from the coal struck the eye with such force as to penetrate into the vitreous. I am satisfied that this can happen, because I have seen them penetrate the corneal tissue so far that I was afraid to use an instrument to remove them for fear they would fall into the anterior chamber, and was obliged to have recourse to the magnet, That he was not conscious of his injury is not difficult to understand, as it is a common thing for a foreign body of this kind to make its presence known only by the secondary irritation of the eye, which results from it, the patient being unable to state where or when the injury was received.

That such serious results follow the introduction of such a little particle into the eye was probably due to the fact that it carried along with it septic germs, because it has been shown that iron particles may remain in the vitreous a long time without causing any inflammatory action or any sympathetic troubles.

This case also shows how difficult it is to ascertain if a foreign body is in the eye, unless we can examine the interior with the ophthalmoscope even when the patient is convinced there is none.

Such a remarkable result of getting a cinder in the eye is fortunately rare, but still we have to deal with other effects at times sufficiently serious to give considerable trouble. Whilst in the majority of cases the accompanying pain and eye irritation are the only unpleasant features, occasionally it happens that either because of septic germs accompanying the foreign particles or because of the traumatism itself in a depraved condition of the system, we have to face a case of rodent ulcer of the cornea. This may be due also at times to the measures used in removing the foreign body. I have recently had such a case which proved exceedingly obstinate and threatened the destruction of the eye, due probably to the attempt of the surgeon to remove the cinder from the cornea with his finger nail. Tooth picks, dirty knife blades, and other such measures have been responsible for similar results.

That ulceration of the cornea results from the above mentioned causes you are all aware, and aseptic precautions are never wasted, even in such a simple operation as removing a foreign body from the eye.

The following case illustrates this:

ULCERATION OF CORNEA FROM CINDER IN EYE.

A. B. Woodward, living at Charlottesville, W. Va., engineer C. & O. R. R., got a cinder or spark from the engine in his eye in August, 1891. It was removed the following day by Dr. Hugh Nelson of Charlottesville, but had remained long enough to leave a small facet or ulcer in the cornea. Whether owing to the introduction of germs with the foreign body or to the lowered condition of his system, the ulcer continued to spread and he went to an oculist for treatment. Hot applications and stimulating salves locally and tonics internally were prescribed. In spite of this treatment the ulcer became worse, and the pain unbearable, notwithstanding the use of anodynes.

When he came to me on September 2, 1891, the necrosing process involved about one-third of the cornea at its lower portion, there was pus in the anterior chamber, and secondary iritis had set up. He stated that paracentesis of the anterior chamber had been performed without relief. I at once applied the glowing platinum bulb thoroughly to the diseased portion of the cornea, including slightly the neighboring healthy tissue. A compress wet in bichloride of mercury, solution 1-2000, was applied with adhesive strips. That night he slept soundly, as all pain ceased immediately after the cauterization. Two days after I thoroughly cauterized it again.

He remained under observation for three weeks, the treatment consisting of hot bichloride applications and atropia locally, and was dismissod with the ulcer thoroughly healed, but with quite a large scar. For this hot water applications and dusting calomel into the eye twice daily were prescribed. In October he went back to work.

In January, 1892, he returned to see what could be done with the whitish spot in his eye, which had much diminished in size. I applied the continuous current after cocaining the eye from a series of 24 Laclanche cells, using a strength of three milliamperes, the positive pole on the cornea, the negative on the temple. He paid me seven visits in all. I had a letter from him April 30, 1892, in which he stated that the eye was as good as ever, with no perceptible opacity, either to him or to a casual observer.

I wish to add that this method of removing corneal opacities is worthy of trial. The application of the current should be only from one to three minutes and repeated when the injection has disappeared.

The treatment of such cases, which we all have to care for from time to time, is outlined in the history of this patient. Its essential basis is antisepsis and no agent is so powerful or rapid in its effects as the actual cautery or galvano-cautery, if you prefer it. This little platinum instrument for destroying the necrosed parts of the cornea and stimulating the neighboring healthy parts to repair can be easily added to your pocket-case. It can be heated in a spirit lamp best, but sufficiently in a gas flame or oil lamp or candle. It should be lightly applied to the whole ulcerating surface, and along the edge of the surrounding healthy cornea. It often puts an immediate stop to the pain, and improvement at once sets in. If any signs of relapse show themselves it should be used again.

The employes of the shops are, like all other workers in iron foundries, etc., frequently the subjects of serious injuries, wounds, lacerations, etc., of the eye that come directly under your observation as railroad surgeons, and apart from the immediate treatment of the injury, the graver question of possibly sympathetic trouble in the other eye and removal of the injured organ has to be considered.

This is a matter of prime importance, not only to the injured individual but also to the corporations you represent, because of its medico-legal aspect. Damage suits have again and again risen out of these injuries, and sometimes the railroad is unjustly mulcted, because it is a fight between an individual and a corporation.

Trainmen and linemen are also at times subject to similar injuries, especially in accidents—injuries that may cause serious detriment to the sight of one eye, with possible danger to the other. These injuries may be divided into three classes: 1st, those from blows by compression or concussion; 2d, from a foreign body cutting or entering an eye, and 3d, from scalds.

Time will not permit an exhaustive discussion of these different forms of injury, and I may best picture them by cases from my record book.

As an example of the first form of injury I present a case of:

W. G. Cosby, thirty-two years of age, a clerk in a railroad office, applied for treatment because he could no longer see his friends at any distance. Five years before was a brakeman on the railroad, and was badly injured in an accident.

In a smash-up he received a blow on the left brow and temple which made a serious cut and fractured the outer orbital edge of the frontal bone. He was picked up unconscious, and was confined to his bed and the house for some weeks. When he went back to his work he discovered he could not see as well as before the accident. Objects at a distance were unrecognizable with either eye, and he could not distinguish anything satisfactorily. Being promoted to a clerkship, his friends thought him "stuck-up," as he expressed it, because he did not speak to them, when the real cause was he did not recognize them. He then bought a pair of concave glasses which improved his vision, but not enough. Hence his recourse to an oculist. Found nearsightedness (myopia) in both eyes, the right one having myopic astigmatism; with the correcting sphero-cylinder vision was 20-50; left eye could not get 20-200 with 5— D.

Ophthalmoscope showed pigment accumulation in fundus of each eye. In this respect they were alike, but the left optic nerve was partially atrophied (the process having been arrested), as shown by its white color and attenuated arteries.

In May, 1892, his right eye with—4 D=1 D ax. 180° was 20-40. the left, however, was only 10-200 with—5 D and the optic nerve looked atrophic still.

This was evidently the result of the concussion, as his vision before the injury was as good as with the other eye. But I never have seen any of the so called cases of "Commotio retinæ" from direct or indirect concussion or compression of the globe, and as Prof. Berlin* has attempted to prove, no such thing is possible. In all probability the optic trouble in this case was the result of the intra-cranial injuries from the blow on the orbit, the patient having been unconscious for some time after the accident, and the pigment changes in the choroid were probably due to minute hemorrhages.

Probably the commonest result of compression or concussion is dislocation of the lens, partial or complete, and its prognosis is serious inasmuch as sooner or later it leads to cataractous changes; or, worse, to degenerative changes of the eye with shrinkage of the eye-ball; or to secondary glaucoma, and sometimes to sympathetic disease of the other eye.

The second class of eye injuries by fragments of tools or machinery wounding or entering the eye-ball is the one we have to deal with most frequently, and as a case in point I will relate the following:

---

* "Zur sogenaante Commotio Retinæ." Zehenders' Klins, Monats, b. 1873, p. 42.

WOUND OF SCLEROTIC BY A PIECE OF STEEL WHICH REMAINED IN EYE UNKNOWN TO PATIENT—SYMPATHETIC IRRITATION.

W. J. Doyle, twenty-seven years of age, boiler-maker, Chesapeake & Ohio railroad, was struck in the eye February 2, 1882, by a chip from a chisel, which made a cut through the upper lid and perforated the sclerotic just above the insertion of the upper rectus. Cornea was clear, little blood in anterior chamber; iris normal in appearance, and vitreous apparently filled with blood. There was no vitreous protruding from the scleral wound, the edges of which fitted closely together. He said he had taken the piece out, as it was quite large and pointed and stuck through the eyelid into the eye. Satisfied with this statement, and as an ophthalmoscopic examination was out of the question, I treated him as a case of simple wound of the lid and sclera. I sewed up the lid, put atropine into the eye, and applied a pressure bandage.

February 5th, eye was much swollen, and had considerable pain. Leeched him. Could not see fundus oculi, but there was a yellowish looking mass projecting from above downward, just behind the pupil, which I concluded to be the retina and choroid detached downward and forming a sac filled with sero-purulent matter. Pain gradually decreased, but the appearance of the eye remained very much in statu quo.

On the 9th, a little pus appeared in the anterior chamber, and on the 10th the aqueous was so cloudy I could not see the iris.

On the 12th, under quinine, iod. potass. and pilocarpine, the aqueous had cleared very much; and on the 15th, there was a perfectly clear chamber, with a very small hypopyon, widely dilated pupil, except upward, with dense yellow reflex above and behind it. Could squeeze pus from scleral wound, and found that same pressure made aqueous slightly turbid with increase of the pus in the anterior chamber. Watching carefully, I found that pus passed down into the anterior chamber from the upper irido-corneal angle, seemingly having burrowed between the sclero-corneal ring and the ciliary bodies and muscle. The iris was detached at this point, as shown by its not dilating in this direction. I evidently had to deal with an abscess between the sclerotic and choroid which had increased the detachment of the uveal coat caused by the foreign body. The pain was kept down by anodynes internally and atropine locally. Warm fomentations were used, and the abscess emptied daily. Paracentesis was performed two or three times to evacuate the pus in the anterior chamber, when it caused much pain.

By the end of February, the detachment of retina and choroid had increased; and as the abscesses still continued to discharge, I suspected that some fragment of the iron had remained in the eye, and I was still more confirmed in this opinion, when about March 4, the sound eye began to show signs of irritation. I then advised enucleation, to which he consented, and removed the globe.

I found a large sac between choroid and sclerotic, with extensive detachment of the former and the retina—the sac being filled with pus, and in the bottom a small piece of the steel from the chisel. The presence of this foreign body explained why the abscess did not improve in spite of treatment. Had I known it was there when he first came to me I could have saved the eye.

In the above case the man's statement as to the removal of the foreign body misled me. He was not aware of the second piece and its presence in the eyeball. Hence, in cases of injury, unless we can examine the inside of the eye with the ophthalmoscope, we can never be certain that no foreign body is within, even though one or more pieces may have been removed. On one occasion I had a case under treatment who had lost one eye and had sympathetic ophthalmia in the other, an intelligent man, who denied ever having been struck or hurt in the lost eye, and yet the eye contained a piece of iron which had entered without his knowledge. Another case in point with entrance of the foreign body is the following:

WOUND OF CORNEA AND CILIARY REGION BY A PIECE OF STEEL NOT REMAINING IN THE EYE.

On June 7, 1883, James H. Eanes, nineteen years of age, whilst at work in the R. & D. R. R. shops, was struck in the eye by a large chip of steel from a chisel, which made a wound in the lower clero-corneal border, from the vertical meridian inward, and around nearly to the horizontal meridian, and then directly inward to the ciliary region about one line. Through this wound the iris, choroid and vitreous protruded—$V=\frac{1}{8}$ due to hemorrhage into vitreous. With a pair of sharp scissors I cut the protruding portion off, applied atropine put on a pressure bandage, and sent him home to bed. I kept him in bed, using only atropine bandage, pill of iron, quinine, mercury and pilocarpine and nourishing diet. Under this treatment he gradually improved, the wound healed, blood in vitreous was absorbed, and vision slowly returned. His condition some months after was as follows: Eyeball normal looking, with exception of coloboma of iris; no depression of scar in the ciliary region, which was hardly noticeable; opaque bands in vitreous, forming a kind of net-work; small detachment of retina near lower periphery; read No. 20 Jaeger, and was still improving when I last saw him.

He died of typhoid fever four years ago, but during the five years after the injury, the eye remained good.

With such an injury of the ciliary zone the question of probable sympathetic disease presents itself.

The prognosis just after the injury was very unfavorable as to saving even the shape of the eyeball; at the best he could not get well for some weeks, and as a mechanic thus thrown out of employment, this was a point to consider, and in addition he had the dread of sympathetic disease constantly hanging over him. The surgeon does not like to sacrifice the injured eye at once, and yet his efforts to save it may result in the loss of both it and its fellow. The result in this case was a good one, and, there being no depressed scar at the ciliary wound, was favorable. Yet I could not say that he would be free from the risk of sympathetic disease even now, nine years after, if he were living.

The third class of eye injuries or scalds from steam, etc., can occur from bursting of a boiler or sudden and uncontrolled escape of steam into the engine cab. As a case in point I may insert the following one to which I was called by Drs. Ross and Brock, on Friday, Nov. 11, 1887:

A. P. Lum, a machinist on the R. & D. R. R., was sent to examine the steam heating apparatus on top of a car which had gotten out of order. Through some carelessness in making his examination an explosion resulted, blowing him off the car into a lot of scrap iron beside the track. He was badly scalded about the face, trunk and limbs. On first examination his eyes seemed to have received slight damage only, and his sight was not much impaired. On close inspection the whole of the epithelical layer of the cornea and the lids was found to have been destroyed. In a few days there was considerable redness of the lids and ocular conjuctiva and the integrity of the cornea was threatened. With the most approved treatment the corneal complication could not be avoided. The whole surface became gray, with small blood vessels ramifying over it, a form of vascular keratitis. Part of the destroyed ocular conjuctiva was replaced in the healing by cicatricial tissue, and in January, 1888, abscesses of the cornea developed.

Everything was done to prevent adhesions between the lids and the eye-ball, but with only partial success. In March and April 1888, the abscess gradually healed without perforation, leaving opacities with vasculization of the cornea. This continued more or less during the whole year and in December, 1888, there was a marked improvement and I operated on the adhesions between lids and balls, freeing the latter and storing good motion. He remained under observation until December, 1889, when he was dismissed with one perfectly good eye, the other still having some haziness of the cornea somewhat cicatricial in appearance. The treatment of this case was directed to preserve the cornea and prevent adhesions. A solution of atropia in castor oil or oil of vaseline, hot applications, and a salve of yellow oxide of mercury, gr. i to the drachm of vaseline, with tonics internally, were the remedies employed. Constant and unremitting attention alone saved his eyesight.

You will observe that in all these cases of injury, except in the one used to show the effects of scalds of the eye, the danger of sympathetic disease of the sound eye at once presents itself, and we must consider the advisability of removal of the injured organ. This is an important question from a medico-legal standpoint, because of the grave responsibility involved. The danger of sympathetic disease is greatest within the first six or eight weeks after the injury, the irritation of the other eye showing itself usually in from two to eight weeks, but it may occur at any time, even years after. Whilst no iron-clad rule can be laid down for our guidance in such cases, it is safe to say in all cases of wounds of the ciliary region (the junction of the cornea and sclerotic and the space surrounding the former extending a quarter of an inch from its margin), or of foreign bodies in the eye, the latter should be removed. When the injury has destroyed the sight beyond recovery it should be done at once and even where there are hopes of saving the sight and the attempt is made, the greatest care and watchfulness are required that we do not lose both eyes. Complete rest, bandaging both eyes, and the use of atropia locally are the best preventives of sympathetic inflammation. Many cases will not submit to an immediate enucleation, and a temporizing policy may be instituted, but enucleation will be the almost inevitable result.

A short time since a boy was brought to me from the Danville shops with his eye cut open by an iron splinter. The character of the wound was such as to leave no doubt of the duty of the surgeon. In the consultation with the surgeon of the road, Dr. Ross, I advised that the eye be removed the next day. Temporarily I cleaned the wound, removing the projecting iris and ciliary bodies. Some of his friends told him his eye might be saved. Instead of coming back to me, he in consequence of this advice went to another oculist, who told him the eye need not be removed. After attending him a week or ten days enucleation became imperative and his eye was taken out. Had this been done at once it would have saved his time and not allowed him to run the risk of sympathetic disease.

Railroads are often sued for damages by such cases, and the greater percaution their surgeon takes in handling them the less the liability. Damages have been claimed for injury to eyes in railway accidents, and sometimes won, when the eye defect existed prior to the accident and was even congenital, as in a case against the C. & O. in which I figured as an expert.

In this case a claim for damages was set up on the ground that he had his eyesight damaged and had acquired granular lids as the result of a collision in which he was much shaken up. The suit was for $10,000. It was shown that his trouble was simple hyperopia, or far-sight, in which the correcting glasses restored perfect vision, and blepharitis, or inflammation of the edge of the eyelids. The lawyers for the plaintiff tried to prove by medical testimony that these affections could be produced by injury. Everyone who knows anything about an eye knows that hyperopia is always congenital and can never result from any traumatism except dislocations or removal of the lens. In his case the lens and its attachments were normal. Moreover he had been under my treatment for the same defect prior to the accident. The blepharitis or lid inflammation was called by the medical men summoned to sustain his case "granular lids" which it does not resemble in the least, and this, too, was claimed to be due to the accident. I proved by authorities that it was impossible for it to result from such a cause, and quoted my case-book to prove he had the trouble prior to the accident. Notwithstanding this the jury gave him a verdict of $2,500 and the railroad congratulated itself at having escaped so cheaply.

This case shows what small pretexts are used to get damages from a corporation and how easy it is to humbug the average jury. I suppose such things will be until a better knowledge of eye injuries among the public becomes more general. Meanwhile, the best protection the roads have against such imposition is the skill of their surgeons and proper attention and care of their injured employes so as to leave as small a margin as posble for complaint.

DISCUSSION ON DR. WHITE'S PAPER.

Dr. A. C. Graves, Cherokee, Kas.—I was much impressed with the value of the paper. I think it covers a fertile field for law suits. The concensus of opinion of all eye surgeons is that the ciliary body is a dangerous region to be entered. Where it is entered we are most likely to have sympathetic ophthalmia to follow. Sometimes we may have an injury of the ciliary body, which after being treated the patient is dismissed, and sympathetic ophthalmia follows. In that case the road would be liable to suit for malpractice. Then again, in cases in which there is iritis we may have synechia follow. This brings on secondary glaucoma, and secondary glaucoma brings on secondary ophtalmia.

Color-Blindness—Its Detention and Correction.

[By James L. Minor, M. D., Memphis, Tenn.]

The importance of color-blindness is world-wide. It concerns all who travel by water or by rail, for upon proper recognition of colored signals the safety of vessels and of trains depends; and it so happens that the colors used for signaling are so imperfectly recognized by four men out of every hundred that they may be confounded the one with the other. To you, as guardians of the safety of the traveling public, the importance of the subject primarily appeals; for to you it looks for its guidance and from you should emanate measures for its protection.

Many of you are perfectly familiar with color-blindness, all of you should be; and to that end I shall present a brief and practical exposition of the subject, hoping that it will excite your interest and further investigation.

Color-blindness, which in no way interferes with the sharpest sight, may be complete when no colors are perceived and intensity of light as light and shadow is the only guide to the outline and recognition of objects; or the defect may apply to one or more of the primary colors. But the most frequent form is blindness for red and green, which alone concerns us, and is found in four out of every hundred men and one out of every five hundred women.

Color-blindness affects all races and conditions of men. It is hereditary, congenital and incurable, but may at times be palliated.

Color-blindness may be acquired from disease or disturbance of the central nervous system when it is only one with (usually) other symptoms of a general disorder, and is not classed as true color-blindness.

Experience has demonstrated the necessity of using red and green signals on railways, and custom has settled upon the former color to indicate danger and the latter, caution, while white means safety. Now a color-blind person can not distinguish accurately between red and green, for he relies upon their luminosity or brightness alone in reaching his conclusions, and under certain conditions he may confound either of these colors with white. Hence it becomes a matter or serious moment to detect the four per cent of such individuals among railway employes.

In devising tests for this purpose it was soon discovered that such as required the naming of colors were unsatisfactory, for defective nomenclature and perfect color perception often coexist; and final selection was made of those tests which required the matching and comparison of colored objects, without the naming of any. That known as Holmgren's has received the sanction of almost universal adoption, and will alone be demonstrated. Holmgren's test consists of a set of Berlin worsteds containing upwards of a hundred small skeins composed of reds, greens, yellows, blues and their derivatives, and browns and grays (these latter "being confusion" colors); and besides these three skeins of large size, known as "test skeins" and colored respectively green, pink and red.

The method of applying this test is to loosely pile the worsteds on a white cloth, in a good light; and, placing the large test skein of green aside, the person to be examined is asked to select and pick out of the general heap those skeins of the same color, darker or lighter, and put them beside it. The normal eyed will do this quickly and without difficulty, but the color-blind will show his defect by selecting besides the greens, or without them, some of the grays, light browns, pale and even full reds.

The test need go no further to prove color-blindness, but Holmgren advises that its variety be established, and this is done by remixing the worsteds, laying aside the large pink test skein, and asking the examinee to select and pick out all of the lighter and darker shades of this color. He will pick out blues, violets or bluish green and show predominance of red-blindness, or full green and grays and demonstrate that green-blindness is strongest. Defective perception for green means faulty perception of red, however, and vice versa. Other forms of color-blindness are as rare as they are unimportant from a practical standpoint, and we may pass them by.

A further test which is of some practical value, because it illustrates the mistakes which may occur in signaling with the color-blind, is with the large red test skein, the color of which corresponds to the danger signal of railroads. This is laid aside, and the examinee is asked to pick out the colors which match it. He will select reds, browns and greens, preferring the darker shades of these colors if he is red-blind, and lighter ones if he is green-blind.

It is obvious from these exhibitions that color-blind people should find no employment on railroads where signals must be recognized. Safety certainly requires this and discountenances even palliation of the condition.

Palliation can be effected, however, and when the means of doing so are thoroughly understood by intelligent, conscientious and painstaking men, I believe it can be done with safety. The plan was suggested by Maxwell, and consists in viewing signals through red and green glass simultaneously. Looking through a red glass a red flag is made lighter and a red light is clearly seen, while a green flag is made darker and a green light is much obscured. Looking through a green glass the red flag is made darker, and the red light is much obscured, while the green flag is made lighter, and the green light is clearly seen.

I have had some glasses of this kind made by F. A. Hardy & Co., of

Chicago, and believe they will be useful in proper hands. With them there can be no difficulty in distinguishing the different signals used by railways, as you can readily see by viewing these red and green flags and lanterns representing railway signals through the glasses which I now show you.

CHAPTER VIII.

FRACTURES AND DISLOCATIONS.

A New Appliance for Fractured Clavicle.

[By Jesse Hawes, M. D., Greeley, Colo.]

I present to you a new appliance to be used as a retentive apparatus in fracture of the clavicle.

Let me modestly state among my first assertions that the appliance probably is not the most valuable contribution that has been made to surgery in the past few years, but its efficiency, neatness, rapidity of application, comfort to the patient and small cost to the surgeon commend it my judgment, formed after using it several years, as superior to any dressing generally known to the profession.

In my remarks I shall premise that a fracture of the clavicle has occurred, has been properly diagnosed, properly reduced, and that we seek the most perfect apparatus for retention.

This paper then will not be an essay upon one of the most frequent fractures of the body, it will not be a treatise upon the clavicle or scapula or their muscular attachments. I accept the dictum of the majority of surgical writers that the object of a dressing should be to carry the shoulder joint upward and outward and backward.

Premising then that a correct diagnosis has been made, that we seek a dressing that can perform what surgeons have required, I shall ask you to look over with me some of the common appliances and methods and note the objections that may justly be urged against them, and which in a great measure are obviated by the newer apparatus.

The objection against lying on the back is that it is a most wearisome and tedious method to which no busy man or woman will submit if they have ever once heard of a method less confining. Velpea's dressing remains nicely in place—in a wood cut only. True, men skilled in the use of silicate or gypsum may make it a fairly stable and comfortable dressing, but the great majority of men who are called to dress fractures of the clavicle are not skilled in the use of silicate of sodium or gypsum. Ask any expert in the manipulation of plaster of paris if my statement is not correct. Further, it can not carry the shoulder upward and retain it there with the ease and comfort of the new dressing.

The objections to the figure 8 bandage across the shoulders are that it carries the shoulder backward only, not upward, not outward; that the sound shoulder, which is the point of fixation, is not fixed, but is decidedly mobile; that to be of value it must be taut, and if tight it is almost unendurable.

The shawl as proposed by Dr. Moore, of Rochester, has nearly the same objections, and has an additional one that on account of the space occupied by the shawl the patient must go about the street dressed in a great coat.

The axiliary pad used by Bartlett, Fox, Hamilton and others, if used as a fulcrum, endangers the brachial artery and nerves—if not used as a fulcrum is better replaced by a pledget of antiseptic absorbent cotton.

Hamilton, after calling attention to the apparatuses of Fox and those similar to it, and after adopting it as a model, declares that notwithstanding the improvements he has added: "It is impossible to carry the shoulder out," and almost impossible to carry the shoulder back, and I will add that I can not understand how it is possible to carry the shoulder well upward and retain it comfortably in that position, either by Fox's apparatus or by Hamilton's modification of it.

The principles and practice of Sayre's dressing are accepted by a large number of surgeons; the majority of surgical works give it an illustration, but it is a sticky, uncleanly, annoying dressing. Further, the weight of the arm and shoulder must be borne wholly upon the olecranon process, or to avoid this a slit is cut in the adhesive dressing and the weight transferred in great part to the sharp edges surrounding the slit.

Be as careful as I could in dressing fractures after this method I have rarely failed to produce an inflamed elbow. This result perhaps is always the fault of the surgeon, but so long as surgeons shall be wanting in skill to avoid this a dressing that can secure the best results of the Sayre without its annoyances must be preferred.

There is a method of holding the shoulder upward, outward and backward by fastening a cross above the shoulders, of which one arm of the horizontal portion extends beyond the acromion process upon the side of fracture; from the outer end of this point of the cross a strap extends into the axilla and is used for drawing the shoulder into the ideal position.

I have crucified several persons who were so unfortunate as to have a fractured clavicle and to entrust themselves to me during my crucifying period, and I here in humility repent. I will crucify no more.

The cross, as I have seen it used, is an instrument of torture. It presses upon the axillary vessels and nerves; it stagnates circulation, it produces numbness. If patiently worn long enough I believe its strap could tie off the arm as our fathers tied off hemorrhoids.

The appliance I offer as a substitute for the above dressings consists of three parts, which for convenience of description I shall designate as the arm portion (Fig. 2), the shoulder shield (Fig. 1), and the clavicle depressor (Fig. 3.)

The arm portion and the shoulder shield are made of wire screen described by hardware men as one-quarter inch mesh No. 15 wire.

The clavicle depressor is made of ordinary sheet iron. The arm portion for the average adult is made from a piece of screen about 16 inches long and 8 inches wide. It should be so formed as to loosely encircle three-fourths of the bent arm from the wrist to a point four or five inches above the elbow. The radial surface of the arm is not enclosed. The texture of the screen is such as to permit it to be molded quite easily into the form we desire by any ordinary tinsmith or ordinary surgeon.

The arm piece should be deeply indented opposite the olecranon process and the condyles to avoid all pressure at these points.

The margins of the piece can be easily covered by ordinary rubber adhesive plaster.

A strong piece of webbing or belting or roller bandage is attached to the outside of the splint over the olecranon prominence. It should be so long that when the arm piece is applied to the arm the webbing can pass obliquely across the back and over the opposite shoulder, where it is buckled to its opposite end. A similar piece of webbing is attached to the distal or manual end. The arm piece is to be applied to the arm corresponding to the injured bone. A soft padding of cotton should line the arm piece. The shoulder shield is placed on the shoulder opposite to the fracture and should be molded to its contour. A soft pad should be beneath it when in position.

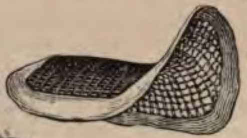


Fig. 1.

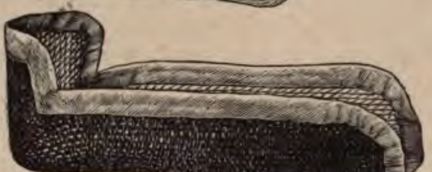


Fig. 2.

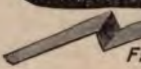


Fig. 3.

The diagnoses of fracture of clavicle having been made, the arm corresponding to the injured side is cradled in the arm portion of the dressing, then the belt attached to its olecranon end is carried through the axilla, over the scapula over the opposite shoulder, protected by its shield, and is buckled to its opposite end. Now grasp the wire appliance at its elbow and push the shoulder upward, outward, backward, and tighten the belt until it retains the shoulder in the position where placed. Carry the manual belt through the axilla over the shield, tighten until the hand is brought near to the shoulder, and in most cases this is all that will be necessary to do until the dressing is permanently removed and the patient discharged.

The olecranon strap will hold the shoulder upward and backward; the manual belt will, by drawing the elbow inward across the chest, make of the breast a fulcrum as safe as we can use or will need. Indeed, when the shoulder is carried upward and backward sufficiently the fractured ends can be nicely approximated, and there will be little desire of carrying the shoulder outward.

I have spoken of a clavicle depressor. In many cases it will not be necessary. In a few where it is aimed to secure the least possible deformity it will be of material advantage. It is made of a piece of sheet iron, an inch wide and about six inches long, bent inward a little above its center, sufficient to reach over the clavicle, the upper end extending about two inches above the clavicle; this must be padded and a strip of adhesive plaster may be sewed to the padding. To hold this in position and to depress the clavicle I have resorted to the following device: Sew a short piece of elastic webbing upon a strip of rubber adhesive plaster, sew a buckle to the webbing, hold the buckle opposite the clavicle, draw the plaster and webbing vertically downward directly over the depressor, stick the plaster to the skin of the chest. Apply a similar elastic and adhesive plaster (without the buckle) in the line of the depressor down over the scapula; buckle the two elastics over the depressor. The amount of force necessary to depress the clavicle can be regulated as desired.

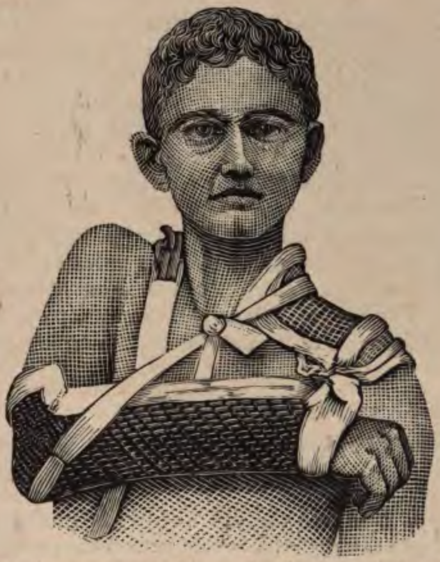


Fig. 4—A new appliance for fractured clavicle.

In presenting this appliance for your consideration, I desire to direct attention to what I regard as its chief merits:

1. By its use the ordinary adult shoulder can be carried upward and retained permanently and comfortably at an elevation of from one and one-half to two and one-half inches above its ordinary position.

2. Elevating the arm when the elbow is carried forward and inward carries the shoulder backward and slightly outward.

3. The posterior portion of the olecranon strap, in its course from the elbow to the opposite shoulder, passes over and binds down the scapula of the injured side. This is regarded as important by many surgeons.

4. The heavy wire intended as directed above removes all pressure from the olecranon and condyles and transfers it to a part where it is easily borne.

5. The belt carried from the base of the neck to the opposite shoulder is nearly vertical and more certainly assures an upward lifting of the arm and shoulder than the Sayre appliance, which, lifting from the point of the shoulder, exerts its force more obliquely and therefore less efficiently.

6. The shoulder shield protects the tissues of the neck and shoulder from injurious and uncomfortable pressure.

7. A single arm piece and shield is suitable for a wide range in size of arms and shoulders. The form is easily changed.

8. There is no pressure upon the nerves and vessels of the axilla. The dressing is applied almost in a moment and will not get misplaced. It is cleanly.

9. It is cheap. An arm piece, shield and depressor should be furnished by the tinsmith at a cost not to exceed 50 cents.

DISCUSSION.

Dr. E. Griswold, of Sharon, Pa., said that after using the great Frenchman's apparatus, and that of Leviss and the others which had been mentioned, he had come to the conclusion that we could not make perfect cures in adult cases, especially in persons of thin muscles. As a rule we could get good results, but cannot maintain perfect coaptation. Therefore having learned this fact, he had switched on to a method of his own which was similar to the methods practiced by other surgeons, although he had never known any one to do exactly as he had done. His method accomplished the objects attained by the methods of Dr. Hawes, of Colorado. The principle was the same as that involved in the apparatus of Dr. Hawes.

Dr. Milton Jay, Chicago, described the method of dressing for fracture of the clavicle which he hastily improvised for a case some ten years ago, and which he said made one of the finest dressings he had ever had.

Treatment of Fractures Involving the Elbow Joint.

[By Dr. W. H. Buechner, Youngstown, Ohio.]

The prognosis of fractures through and in the immediate neighborhood of the elbow joint has always been regarded as being very bad. In spite of the most careful treatment long continued functional disturbance, if not complete anchylosis, usually follows.

Sir Astley Cooper says that fractures involving the elbow joint always seriously impair its motion. Malgaigne warns against promising good results when joints are injured by even the slightest fractures, saying that good results in such cases are exceptional. Hamilton says that fracture of the internal epicondyle is very often followed by serious impairment of function, and that the usual result of T fracture of the lower end of the humerus is permanent deformity and anchylosis. Paul Bruns also declares that it is very difficult to prevent anchylosis in articular fractures.

My observations upon which this paper is based were made while assistant surgeon to von Volkmann's clinic at Halle, Germany. Since the adoption of Prof. Oberst's method of treatment (described here and published by him in the "Sammlung der Klinischer Vortræge," No. 311) in that institution, the results have improved to such an extent that anchylosis is now about as rare as movable joints formerly were.

As the first cause of anchylosis in these cases we will consider long continued immobilization, It is a well known fact that continued immobilization of a joint causes serious disturbance of its function. The muscles form contractures and frequently undergo fatty degeneration, while the fasciæ and ligaments shorten. The articular cartilage softens and is destroyed, while connective tissue forms in the cavity of the joint and more or less completely obliterates it. The truth of these statements is proven by the experiments of Menzel and Reyher as well as by a number of autopsies.

Oberst (1) points out as a less well known result of immobilization an occasionally abnormal mobility of the joint. After continued immobilization of the knee he has frequently observed a laxity of the ligaments which rendered a brace necessary, and in cases in which this was neglected marked deformity usually (genu valgum) took place.

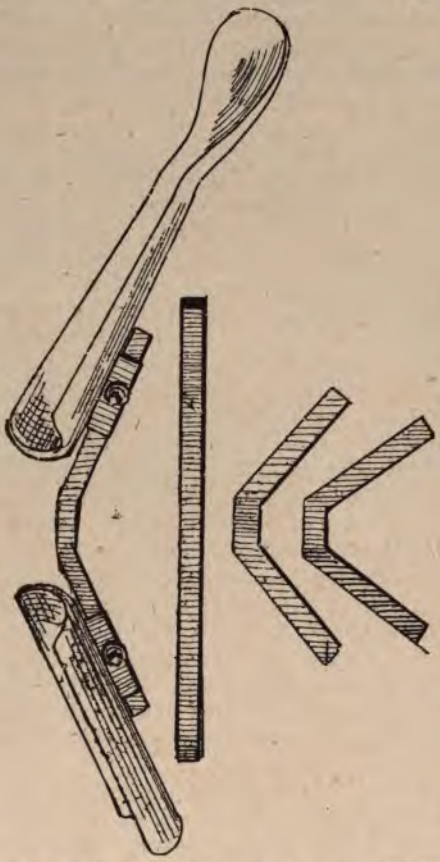
These disturbances are usually not permanent. Under proper treatment the full function of the joint will be re-established. Verneuil goes so far as to abandon all treatment, being convinced that in all eases restitution of function will follow if the joint is left alone. Oberst says that he has seen cases of fracture of the elbow in children where in spite of all treatment the stiffness gradually increased until surgeon, child and parents alike lost patience and treatment was abandoned. Having opportunity to examine some of these cases several months afterward he was much surprised to find complete restitution of function. Too energetic treatment should certainly be avoided. Too vigorous passive motion often causes a partial rupture of the shrunken ligaments and an effusion into the joint which greatly retards recovery.

Another cause of stiffness is the inflammatory process resulting from the injury. This probably arises from the contusions, rupture of ligaments, etc., the natural result of the force producing the fracture. The dislocation of the fragments is also a frequent source of inflammation. If, as von Volkmann has shown, a blood clot can produce such irritation to the serous membrane that a severe hydrarthrus may form, how much more severe inflammatory trouble may we expect from a sharp fragment of bone lying in the joint like a foreign body or piercing its capsule? Since von Volkmann called attention to the fact, it has often been observed that arthritis deformans is a frequent sequence of fractures penetrating the joint. It is therefore perfectly logica to assume that under the above conditions other acute or chronic inflammatory processes leading to more or less impairment of function or to complete anchylosis may arise.

Overproduction of callus is considered a common cause of anchylosis. This is probably more emphasized than the facts of the matter demand. John Hunter and J. C. Petit state that a superabundance of callus in cases of intra-articular fracture is common; but Boyer, judging from his great experience and from several autopsies, claims these statements to be only theories; and it is now generally acknowledged that the production of callus in these cases is very meagre. Bruns (2) says: "The callus usually only fills the line of fracture and seldom extends beyond it in the form of a bony prominence."

It is an entirely different matter however when the fracture is wholly or mostly extra-articular. Here nobody will deny the possibility of an overproduction of callus. Indeed, this almost invariably occurs when the reduction of the dislocation of the fragments is not accomplished. If, as we know, the dislocation alone is capable of producing serious disturbance of the mechanism of the joint, the disturbance will certainly be greatly increased by the overproduction of callus. Koenig (3).

Here we must mention the uncommon cases described by Bruns, in which in relatively intact joints anchylosis takes place by means of bridges of bone which unite one bone with the other. This may occur in cases where there are fractures through the epiphyses of both bones, or where in addition to the fracture of one bone there is such severe contusion of the other that inflammation with formation of a new bone ensues. In these cases the callus may grow from above and below, finally uniting and forming complete extra-capsular anchylosis.



Oberst (4) states that myostitis ossificans of the neighboring muscles may also cause anchylosis.

We will now consider the fourth acuse of anchylosis, the effusion of blood into the joint. I must here emphasize the fact that such effusions accompany all articular and most pars-articular fractures. It has long been known that effusion of blood into a joint may cause chronic hydrarthrus arthritis and stiffness, sometimes reaching complete anchylosis. Koenig says that in many cases the removal of the blood effused into the joint is the chief indication to be met. Von Volkmann has often called attention to the injurious consequences of a hæmarthrus. He has shown (5) by careful anatomical investigation that anchylosis with complete obliteration of the joint may follow when the blood coagulates and the clot organizes. Rapid coagulation is observed in cases where the capsule is badly torn and particularly where a fragment of bone penetrates the joint. (Riedel).

The function of a joint may also be threatened by an effusion of blood into its neighborhood. Here, too, the blood may organize and by uniting the tendons with their sheaths cause stiffness. It is probable that in many cases the stiffness of the hand and fingers after fracture of the lower end of the radius, and of the ankle and toes after malleolar fracture, is due to this cause.

Considering the above, we must conclude that the following must be our course in the treatment of these cases:

1. The joint must not be immobilized too long.
2. The dislocation of the fragments must be reduced and its reoccurrence prevented by suitable apparatus.
3. The effusion of blood must be removed as rapidly and completely as possible.

It would carry me too far to consider the first two divisions at length, so I will simply say that in cases where long immobilization is necessary the dressings should be removed at intervals of three or four days, and passive motion carefully made.

Of the third and less often considered division—the removal of the effused blood—I will speak more at length.

In compression and massage we possess admirable means to accomplish this purpose. Velpeau is one of the warmest advocates of compression in the treatment of fractures and lately (see 6) recommended it very strongly in articular and para-articular fractures. Our experience coincides with theirs that it is a valuable agent in these cases. The pain is not only not increased by it, but is usually diminished in a short time, and we have never seen any evil consequences follow its use. Of course it must be employed with the utmost care, and if the slightest evidence of disturbed circulation becomes apparent the dressing must be removed or loosened. For this reason the patient must be seen at least every twelve hours. The compression is employed only to cause the rapid absorption of the effusion and should therefore be discontinued as soon as this is accomplished, as it is known that it tends to prevent the formation of callus. In the hospital above mentioned compression is always made with a Martin's bandage, but in private practice, where the patients are not as completely under the surgeon's control as in a large hospital, a flannel bandage would be more suitable.

After the dislocation of the fragments has been reduced the limb should be placed upon a proper splint, and the injured joint and its neighborhood encircled by the compressing bandage. The splint must be so constructed that it retains the fragment in position and protects the great vessels from pressure.

The effect of the compression is greatly increased by massage. Bergmann, Wagner and others report good results in the treatment of fractures by massage, although F. Verchere (7) condemns it. Massage should be employed daily, but should be discontinued as soon as the effusion has disappeared, as it may cause absorption of the soft callus.

Upon these principles we treated all cases of fracture involving the joints, using compression only where there was marked effusion and swelling. In cases with little or no effusion we always found massage and passive motion sufficient. We reduced the dislocation with the utmost care, using anæsthesia when necessary, and when the limb was removed from the splint for massage or motion it was so held by an assistant as to prevent its reoccurrence. In severe cases we encased the limb in a plaster of paris dressing as soon as the effusion had disappeared. The plaster dressing was never allowed to lie longer than three or four days, when it was removed, passive motion gently made, the limb massaged and again put into a plaster dressing, but flexed to a different position from that which it had just occupied. We never permitted a splint or dressing to extend further than to the middle of the metacarpal bones, so that the patient had free use of the fingers.

For the treatment of these fractures we employed a somewhat modified levis splint, which, while it keeps the fragments in position, also protects the vessels from the compressing bandage. When this splint is applied to the anterior surface of the arm with the fore arm in the supine position the iron brace fully protects the vessels at the bend of the elbow. I know of no method by which one gets such good results with such regularity as by this, and am convinced that if any of the gentlemen present will try it their results will bear me out in my statements.

---

1. M. Oberst, Volkmannische Sammlung Klinischer Vortræge.
2. P. Bruns, Die Lehre von den Knochen bruecken Deutsche Chirurgie, Lieferung 27.
3. Koenig, Specielle Chirurgie Band III.
4. Loq. cit.
5. R. Volkmann, Zur function des Haemarthros Centralblatt fuer Chirurgie, 1880. No. 10.
6. See Bulletin de la Societe de Chirurgie, 7 Julliet, 1886.
7. F. Verchere, Gaz. des hopitaux, 1887, No. 113.

Treatment of Simple Fractures Involving the Articular Surfaces of the Condyles of the Humerus.

[By Charles W. Rook, M. D., Quincy, Ill.]

There are but three recognized fractures of the humerus involving the articular surfaces of its condyles, namely, intercondyloid fracture and fracture of the external and internal condyles. Reference to such works on surgery as Ashhurst's "Principles and Practices of Surgery" and Erichen's "Science and Art of Surgery," Bryant's "Practice of Surgery," Gross' "System of Surgery," Stimson's "Treatise on Fractures," and Hamilton on "Fractures" shows that the method by them advised for treating these fractures is very well epitomized on pages 246-247, Vol. III, of the "Reference Hand-book of Medical Sciences," from which we quote:

1. "Treatment of intercondyloid fracture. A plaster dressing enveloping the limb flexed at a right angle is to be preferred."

2. "Treatment of fracture of the external condyle. The special point in the treatment is to prevent tilting or displacement of the fragment forward by the muscles of the forearm, which are attached to it, and loss of the outward angle at the elbow by descent of the fragment. The latter is not so

likely to occur as after fracture of the internal condyle, and the injury may be safely treated with the elbow fixed at a right angle, either with a grooved posterior splint or with an immovable dressing."

3. "Treatment of fracture of the internal condyle. Flex or fix the arm upon a posterior or lateral splint or in an immovable dressing for about three weeks, and then carry it in a sling for another fortnight. But it is certain that this treatment frequently results in considerable deformity, because of union with displacement of the condyle upward. The difficulty is not to reduce the displacement, but to maintain the reduction; and this maintenance, for the reasons above given, is endangered by a splint which makes the ulna bear the weight of the forearm. Dr. Allis, who first called special attention to this cause of the deformity, recommends treatment with fixed dressings in the extended position. If care is taken to re-establish the external angle at the elbow when the immovable dressing is applied the ascent of the condyle will be prevented; but the dressing does not protect equally well against displacement of the condyle forward or backward, and therefore a large antero-lateral fenestra should be made at the elbow so that the part can be inspected with a view to the early detection of such displacement."

From these quotations it is evident that this time-honored method of treatment, which is admitted to "frequently result in considerable deformity," is faulty in principle and should be corrected. Its two most serious objections are, first, the almost certain production of more or less persistent anchylosis, and second, the frequent deformity and consequent impairment or function by displacement, upward or downward, forward or backward, of the fractured condyle.

A method of treatment by which the occurrence of these evil results can almost certainly be avoided is presented for your consideration. Reduce the fracture, envelop the joint in an elastic band, immobilize the arm in any comfortable and natural position and support the fore arm in a sling about the wrist, unless the position of complete extension, as advised by Dr. Allis, be employed.

In from twenty-four to forty-eight hours after the receipt of the injury, remove the sling and splints, reapply the elastic band if found loosening, retain the fractured condyle in place with one hand while the other causes the fore arm to partially execute the movements of flexion and extension, pronation and supination; then reapply splints and sling, if the latter is needed, but with the arm in a different position than at the previous dressing. Passive motion should be employed daily until recovery. The splints need not be used longer than ten days. The early use of the elastic bands is important; first, because this application will prevent so great an effusion in and around the joint; second, by its constant pressure hastening the absorption of the existing effusion; and third, it greatly aids in maintaining the fractured condyle in position.

The sling should be narrow and encircle the fore arm only at the wrist, for if wide or placed near the elbow it will serve as a fulcrum for the fore arm and hand to displace the fractured condyle upward.

The early and frequent practice of passive motion is of the highest importance; for by it both anchylosis and deformity can be prevented. It is a self-evident fact that the condition of anchylosis can not occur where passive motion is practiced, as evident also is the fact that deformity can not occur if the fore arm be made to early and frequently execute its normal movements.

I have successfully treated by the method here advised one fracture of the internal condyle and two intercondyloid fractures.

* * *

CHAPTER IX.

AMPUTATIONS.

Double Synchronous Amputation.

[By Surgeon Lester Keller, Beury, W. Va.]

When I promised Dr. Brock to prepare a short paper for this association, I had no idea how hard it would be to select a subject—one with which I was somewhat familiar and at the same time one interesting to the members. If Dr. N. C. Lynde's statements are correctly reported in *The Railway Age* of July 11, 1891, I presume I am more familiar with my subject than the majority of surgeons of the present day, and how interesting I may make the subject remains to be seen. That the mortality has been great in these operations, and will continue so, even with our antiseptic surgery and improved methods of operating, cannot be gain-said.

The very fact that a double amputation is needed is sufficient proof of this. And then how seldom do we see a man run over by a car, crushing two of his extremities, without further complicating the case. He has had hemorrhage, often severe, or was drunk when run over, or his head was thrown violently against the ground, or he must be roughly transported a distance in a box car before you can reach him, all of which tend to add to his shock.

We cannot stand idly by under such circumstances; something must be done, and done at once. Because his chance for recovery is slight is no excuse for inaction. Even that he may die under the knife is no excuse for a "do-nothing" policy. He should expect of us every ray of hope we could possibly hold out to him.

I wish to report briefly seven cases it has fallen to my lot to have a hand in. I do not claim exclusive work in all of these, as we are a very democratic set in West Virginia, brother Sharp's famous resolution to the contrary notwithstanding. When an accident has occurred where two or more amputations are required, and two or more doctors are present, we make it a rule to let the honors go around and each do one, so you will pardon me for referring to the other doctors present and helping in each case.

July 15, 1886, Joe Smith and William Orricks were run over near Caperton by a freight while sitting on the rail drunk. Dr. John D. Meyers of Huntington and Dr. L. R. Rupert of Nuttall were present, and we amputated the right thigh at the junction of the middle and lower thirds and left leg at junction of middle and upper thirds for each man. Smith had in addition quite severe injuries about the head, having a slight fracture of right parietal. He never recovered from shock, while Orricks made a good but rather tedious recovery, and now makes a living by running a country store, getting around fairly well on two artificial limbs.

August 28, 1886, John Morrison was run over by shifting engine in Sewell yard while drunk. We transported him to Caperton on the tender of an engine and carried him to a shanty out of which he had that day moved. Dr. J. P. Hughart of Sewell was present, and we extemporized a table by taking the door from its hinges and placing it on two rain-water barrels and by the light of a coal oil hand-lantern amputated the left arm three inches below the elbow, the right hand through the middle, but by careful management we saved a part of a little finger and part of the thumb. We amputated part of right foot with three toes. In addition he had two cuts across the right shin four and six inches long and two severe scalp wounds.

When we were through we put him on a pile of straw he had emptied out of a bed-tick in the corner of the shanty, and left him in charge of a drunken companion. The next day he was placed on a bunk on some clean straw and subsisted on the charity of people in the neighborhood who saw fit to send him something. In spite of all this and in face of the fact that it was impossible to do the work aseptically and we could carry out no antisepsis to speak of he recovered and moved to Ohio in six weeks and I have never heard from him since.

The following day I was called to Keeney's Creek to see a four-year-old child of David Hopkins, run over by coal car on the side track. Dr. Rupert and I amputated the right arm three inches below the shoulder and right thigh just below the trochanter major. The child never recovered from shock.

March 31, 1888, Rufus Thomas, colored, ten years old, was run over by a freight train at Stone Cliff. Dr. Robins of that place and myself amputated left thigh close to hip joint and left arm two inches below shoulder. He survived the operation and gave promise of a good battle for life, but died a few hours afterward apparently from exhaustion.

January 22, 1889, I saw William Bupert, aged thirty, colored, blown up with dynamite while removing a slide on Rush Run branch of C. & O. Both hands were blown entirely off and one eye was blown out. While I could see little to encourage me in such an undertaking I yielded to his entreaties to "do something" and the importunities of his friends and amputated both arms just above the wrist and removed the fragments of the eye. The only assistance I had was a colored man who held the chloroform after I had the patient anæsthetized. He only partially rallied from the operation.

March 21, 1891, Paul Marshall, colored, aged twenty-three, while under the influence of liquor was run over by a material train at River View. I took him to Prince station, a distance of twelve miles, in a caboose to a cabin of two small rooms in which ten persons already lived. While helped by Dr. J. J. Kaptonstall of Stone Cliff and Dr. Robins we amputated the right thigh at the middle and the left a Pirogoff's operation. We were compelled to use new crash towels for sponges and cotton spool thread for part of the sutures, but in spite of this he never had a rise of temperature except on the second day, when it run up to a hundred and never above normal. After the third day, the wounds healing without pus, I used braided silk for my arteries, cut it short and used no drainage tubes; dressed the thigh with iodoform and the Pirogoff with boracic acid.

To do a double amputation, under favorable circumstances, on a stout man who is only injured in the extremities removed, of course promised good results, but when we find them, as we often do, bruised and bleeding, exposed to the weather and probably drunk when run over, at least full of whiskey by the time you reach them, as every new comer insists on giving the injured some whiskey, no matter what his condition and no matter how much he has just had; when one must transport him miles in a box car or on an engine, and maybe then take him to a hovel where everthing is dirt and grime, where you can not get a clean pan to wash your hands or a clean towel to wipe them, it does seem strange that any of the subjects recover, and I am sure every one of you have had such experiences and know that the picture is not overdrawn.

The technique of an amputation is presumed to be familiar to all, so I will not discuss it. When to amputate, is a much more important question from the patient's point of view, and especially so if it be a double amputation. I have more than once seen men with both legs crushed when I could not help thinking if there had been less indecision and more hurry, the life could have been saved, I think we have better results if we amputate just as soon as we reach our patient, unless he is in a positive state of collapse. To wait, fearing we may lower our record of recoveries or that our patient may die soon after or even during our operation is dodging the question.

One more point and I am done. There has been growing among the profession lately a tendency to ignore the teaching of generations of experience. It has been a law religiously followed until lately to save every particle of stump possible in making amputations, and it seems to me a law that we can not improve upon, especially in double amputations, where the loss is great the best we can do. To go above an ankle instead of through it because the artificial legmaker can better fit a limb to the stump, is certainly shouldering a pretty heavy load to accommodate the leg-maker. It seems to me to be more scientific and humane to educate the limb-maker than sacrifice any of the patient.

I lately saw in New York, when looking the subject up a little, men and children walking without complaint, so naturally as to almost defy detection, on feet fitted to Pirogoff, Symes and Chopark stumps. These are amputations that have stood the test, and these we should be very slow to discard when we have injuries demanding them.

Two Hundred and Sixty-four Amputations; with Deductions.

[By W. L. Estes, M. D., South Bethlehem, Pa.]

The little of this paper does not represent the aim of the writer accurately, as the intention is chiefly to bring before the association a certain regime instituted upon the Lehigh Valley railroad for the purpose of rendering first aid to the injured as quickly and as efficiently as possible. The statistics of amputation are taken to emphasize the good the system has accomplished and the especial theory upon which the system was established.

The etiology of surgical shock is variously stated, and like all obscure physiological and pathological conditions has many individual interpolators and some skeptics. Oft recurring opportunities to observe and study this condition gradually weakened the writer's adherence to the old and most commonly blind theory of a purely nervous origin of shock—or at least to the theory that the condition was produced by a powerful and sudden impression on the nervous centers through the injury of a large number of peripheral nervous fibres. The theory of inhibited heat production or rapid heat dissipation seems to state simply one phenomenon of shock; a more recent theory ascribes shock to the agency of the vasor-motor nerves; all of these ideas have a part of the truth and describe one or more of the phenomena of shock, but seem not to reach nor to express the cause intelligibly. After a number of years of observation and study of a large number of cases of shock the writer feels warranted in expressing his conviction that the true cause of most cases of surgical shock is loss of blood. I believe if the members of this association will analyze the cases of shock they have seen and treated, they will find that the condition has been most marked (barring all cases of injury to the nerve centers) in instances where the loss of blood has been comparatively great. I do not deny that there is commonly a condition of great physical prostration manifest immediately after severe injuries, before hemorrhage has taken place, but I believe this is due to psychical effects rather than to physical, and I believe it precedes the injury. It is a notable fact that persons injured while asleep and while there is no sort of anticipation or premonition of injury suffer very little from this immediate shock.

It is further a notable fact that persons who have been seriously crushed or maimed by an accident feel little or no pain during the crushing or while being injured. Out of several hundred cases of severe injuries on railroads and in mills or mines I have found but one man who said he had pain at the moment he received the injury. Dr. Helm, of Zurich, Switzerland, has investigated about 2,000 cases of accidents by falling from heights, with reference to this very point. He says that in no case was there any pain at time of accident. "One hears the fall of the body but does not feel it," say the victims who survive. This means an anticipatory sensitivity which deprives the injury itself of any further reflex nervous prostration. It seems as though the awful horror and abject hopelessness which possess the victim about to be crushed or mutilated at the moment of receiving the injury brings about this condition which we call immediate shock. That this mental effect alone is sufficient in some instances to produce death is also abundantly proven. But given a case of ordinary mental susceptibility, the psychical effect rapidly wears away, and unless immediately or very soon fatal, the case only proves so afterward, usually through loss of blood. Reasoning from the foregoing facts and belief I wish to advocate the saving of blood as the cardinal point in the treatment of every major injury, and in the performance of every major operation.

If this proposition be accepted it follows that the success of any operation after an injury depends very largely upon the loss of blood previous to the time the patient is brought to the operation table. When I was convinced that the condition of prolonged shock is produced by a relatively large loss of blood the idea suggested itself that if by any means injured men could receive soon after the accident proper measures for arresting or preventing hemorrhage, that not only would fatal collapses occur less frequently, but the mortality after operations would also be much reduced. The cases which come to St. Luke's hospital requiring amputations are drawn largely from the Lehigh Valley railroad. As surgeon in chief of this railroad I was given the privilege of acting upon the above idea. Accordingly I had made a small tin case and arranged in this case a set of simple apparatus consisting of two Esmarch's tourniquets, half a dozen muslin bandages, absorbent cotton, stryptic cotton, sublimated gauze, sublimate tablets, green soap, bicarbonate of soda and a case containing needles, a pair of forceps and a pair of scissors.

With every case, pasted just within the lid, is a set of simple rules for the use of the apparatus, the stoppage of hemorrhage having especial prominence. I also gave to a number of the station agents and employes some practical instruction in the use of the apparatus.

At first these cases were distributed to the principal stations and the wrecking cars only. They were so efficient and did such good service that finally we distributed them not only to the stations and wrecking cars, but required every passenger train to have them.

It is our custom to require that every injured person shall receive aid from this case if the injury requires it. If any case is not attended to properly inquiry is immediately instituted as to why he was neglected, and the guilty person or persons called strictly to account.

The results following the use of these accident cases have repaid many times over the cost of supplying them, as will be seen from the following statistics:

In the last ten years and six months there have been (excluding euthanastic operations on hopeless cases) 252 single major amputations at St. Luke's hospital and 14 deaths—a mortality rate of 5.55 per cent. There were 13 hopeless cases.

Dividing this time into two periods, first, before the introduction of the accident cases on the Lehigh Valley railroad, and second, the period since they were introduced, the first is six years, and in it there were 114 single major amputations and nine deaths, a mortality rate of 7.89 per cent. There were nine hopeless cases. In the last period, four years and six months, during which the regime has been in force, there were 136 single major amputations and five deaths, a mortality rate of 3.67 per cent. There were four hopeless cases only.

The contrast is a double one, viz.: In the first series there are 114 major amputations with a mortality rate of 7.89 per cent; in the second series there are 136 major amputations and a mortality rate of 3.67 per cent. A larger number of operations and the mortality rate reduced a little more than one-half. Again, in the first series, containing fewer operations, there were nine hopeless cases; in the second series there were only four hopeless cases, less than one-half.

The double synchonous amputations exhibit the difference in even a greater degree. There were altogether 29 double synchronous operations and 8 deaths; mortality rate 27.34 per cent. In the first period (six years) there were 13 cases and 6 deaths; 46.25 per cent mortality. There were 5 hopeless cases. In the second period there were 16 cases and only 2 deaths; mortality rate 12.5 per cent. There was only one hopeless case. In the first period there were two triple synchronous operations—both cases died. In the second period there were five triple synchronous operations and all but one case recovered.

These statistics show 50 per cent less mortality after amputations since the use of the apparatus on the railroad. The argument, it seems to me, is incontrovertible. While not acquainted with the methods in vogue I am sure other roads have some devices for rendering first aid to the injured. If surgeons in selecting apparatus have not emphasized blood-stopping devices I beg to urge, in view of the above statistics, the necessity of Esmarch's tourniquet in every accident case. Such an appliance in the hands of a layman may do harm, you may say. True, it may now and then be abused—what tourniquet is not? The good it does is so far beyond any evil which may result that such abuse ought not to weigh at all against it. Besides, it is the only tourniquet in the hands of a layman which will surely and absolutely stop hemorrhage.

Not only should a patient be preserved from hemorrhage before operation, but also every possible safeguard should be practiced against the loss of blood during an operation. Esmarch's elastic constriction is of course universally used in amputation of the extremities through any of the ordinary regions. When, however, an amputation must be done at the shoulder joint or hip joint the question of controlling hemorrhage is not so simple. As several methods may comparatively easily be employed to control hemorrhage during an amputation at the shoulder joint besides elastic hæmostasis, I shall not detain you to discuss the methods to be employed here. The factor that has more than all others besides made an amputation at the hip joint dangerous and commonly fatal was the hitherto great difficulty and uncertainty of the methods employed to control the circulation. The levers of Pancoast, Lister and Davy, the methods for constriction recommended by Landis, Esmarch, Furneaux, Jordan and Freudelenburg were all either very dangerous or uncertain, in some cases both. Wyeth in 1890 recommended by odds the best method for controlling the hemorrhage by elastic constriction during hip joint amputation. It has been my fortune to have four cases of amputation at the hip joint in such conditions that none of these methods seemed to me safe or proper. Arguing from the standpoint that shock is usually but an expression of acute anæmia, and further that in other conditions requiring a large loss of tissue and where—though the dissection must necessarily be slow and prolonged—if the loss of blood be prevented the patient usually recovers, I concluded to try the gradual dissection method for amputation at the hip joint, carrying out the same precautions and methods for controlling and avoiding hemorrhage one usually employs in removing large tumors. It worked excellently well. The patients recovered. The condition of the patient after the operation exhibited no particular evidences of shock. The method so far has been used four times alone, and once in combination with the Furneax-Jordan method. Out of the five amputations at the hip joint one patient died.

The first step in the operation is by means of an Esmarch bandage to force all the blood out of the extremity unless the extremity has been so crushed that this is impossible. Secondly, the femoral vessels are tied by double ligatures and the vessels dressed between the ligatures. The rubber band may now be removed. Third, an anterior flap is gradually dissected up from without inward. Great care is taken to secure all known vessels before they are cut, by means of double ligatures or two hæmostatic forceps, and all muscular or small branches when cut must immediately be secured. After the capsule is reached anteriorly the posterior flap is dissected up with the same care as to securing the blood vessels. Finally the capsule is incised, and disarticulation is accomplished after the usual methods. The essential feature of the operation is the securing of each vessel before it is cut or immediately after being cut. There is usually no difficulty in securing any vessel except the profunda and internal circumflex arteries. There is no oozing to speak of after this operation and this feature makes it particularly valuable in very much weakened or exhausted cases.

It is difficult to estimate just how much blood is lost during an operation. I feel sure, however, that in none of my operations at the hip joint except the last one was there more than an ounce of blood lost. On this account I call it the bloodless gradual dissection method.

The cases operated upon so far were as follows:

1. Boy 12 years old, who had previously had an exsection of the hip joint without relief for persisting necrosis and suppuration about the hip joint. The whole upper third of the thigh was tunneled by sinuses, and the extremity was perfectly useless. He was operated upon by employing elastic constriction in a figure of eight manner over the groin, and there passed a long lateral splint reaching from the axilla to beyond the toes on the sound side. This controlled the circulation perfectly on the affected side and gave wonderful facility in securing the tourniquet, preventing its cutting into the side and its constricting the abdomen, while it permitted convenient placing and retention of the patient during the operation simply by placing the end of the splint upon a high stool after the patient's buttocks had been drawn down to the edge of the operation table. Besides the amputation the greater part of the body of the ischium and a part of the ilium were exsected. The boy made an uninterrupted and uneventful recovery.

Case 2. Osteo-sarcoma of the upper third of the thigh. This operation was done before Wyeth published his suggestion of using long pins to hold the tourniquet in place. The former was so high up however that this method could scarcely have been employed. I tied the femoral vessels near the base of Scorpa's triangles and gradually dissected from without inward. The profunda artery was very difficult to secure on account of the very near proximity of the tumor. The operation lasted about 80 minutes—certainly not more than an ounce of blood was lost. The patient had no particular shock and made a rapid and complete recovery. In the hospital 30 days.

Case 3. Man, slightly demented, 38 years old, was run over by the cars. Brought to the hospital several hours afterwards, when it was found that the extremity from the knee to the trochanter major had been literally comminuted. He had lost so much blood that he was well-nigh exsanguinated. No pulse at wrist when brought in. By the expedient of a lung axillary lateral splint of the uninjured side, an Esmarch's elastic tourniquet was put on and secured and luckily the comminuted tissues held together sufficiently well to admit of the application of the tourniquet. This controlled the hemorrhage. The mass of mangled extremity was enclosed in antiseptic dressing, the man put to bed and stimulated. He was so weak that for two days nothing was done. Then, still in an extremely weak condition as you can well understand, the amputation at the hip joint after the gradual dissection method was done. No particular shock. He was apparently in about as good a condition after as before the operation. The dissection had to be carried far up into the gluteal region to get a flap. The only vessels giving trouble this time were the internal circumflex—though the sciatic had to be tied high up. Operation lasted about 90 minutes. Recovery was slow on account of sloughing of the muscles on the anterior surface of the stump, due to the severe injury and compression of the elastic tube for so long a time.

Case 4. Boy twelve years old—comminution of whole lower extremity to trochanter major by wheels of coal car. Almost exsanguinated when brought to the hospital. Same treatment as case 3; was operated upon about 30 hours after admission. Gradual dissection method. Slow recovery with suppuration, the wound had grease and coal dust fairly ground into the tissue and the comminution extended so far up it was impossible to thoroughly clean the wound.

Case 5. Large osteo-sarcoma of upper third of thigh, involving the bone to within one inch of trochanter major. This man had a history of severe injury to the thigh and back, occurring about two years before. His home physician considered his condition probably a result of the old injury and sent him to the hospital as a case of necrosis of femor. He was a young man 24 years old, excessively weak, hectic and pretty high temperatures. After examination he was told that he had a tumor of the bone and that the only possible chance was amputation at the hip joint. He refused to have the operation done for some time and only gave his consent when he was so weak that he felt he could not live much longer. He was brought to the operation table having a pulse of 136, and very weak. It was a desperate case, and I told the gentlemen present who came to witness the operation that very likely he would die on the table. As, however, two apparently hopeless cases had recovered, I determined to try the operation. The tumor was about six inches vertical diameter and about four inches in transverse diameter. I found after cutting through the skin and deep fascia that the pheriphery of the tumor reached almost to the acetabulum. This made the dissection very difficult. I had tied the femoral vessels just above the beginning of the profunda. I found, however, the ordinary muscular branches increased to the size of the large branches of the femoral at this region and the tumor itself made up of large vscular spaces. So that in spite of the greatest care there was a considerable loss of blood. The patient had a fit of syncope before the operation was completed, revived by stimulants, bandages to the other limbs and lowering the head. On account of the great difficulty of the dissection and large number of vessels to be tied the operation was prolonged, and when the capsule had been opened and all the muscles cut except the adductors, an assistant, in attempting to force the head of the bone out of the acetabulum, fractured it, as the tumor had softened it below the trochanter major. This made it a very difficult matter to wrench the head of the bone from its socket. Finally this was accomplished, and as all the vessels had been secured a few seconds sufficed to irrigate and close up the wound. The operation took about ninety minutes. After the operation the patient was in a very low condition, but rallied under stimulants, and I believe, notwithstanding his desperate condition, would have recovered but for the fact that his stomach rebelled. From the time of the operation he was able to retain scarcely any food at all. He lived three days, then died of exhaustion.

I think every operator who has had to deal with the severest forms of railroad crushes and had to operate on men exhausted by large osteo-sarcanata will agree that a 25 per cent mortality in hip joint amputation upon five such cases as I have detailed is certainly a good showing for the bloodless method.

The older statistics are almost valuless as standards of comparison for modern amputation. Especially is this true of hip joint amputation. Ashhurst, in his "System of Surgery," published in 1881, gives 66.1 per cent as mortality for operation done for injuries in civil practice, and 40.2 per cent as mortality following amputation for disease. This is certainly a much higher rate of mortality than now prevails in the best modern hospitals. I am unable to find any statistics of hip joint amputations of American surgeons for the last decade. I think, however, those of two English surgeons recently published are well up to the best modern results, and I believe they will serve as fair standards.

Frederick Page, surgeon to the Royal infirmary, Newcastle-on-Tyne, summarizes the result of his amputations treated antiseptically from January 1, 1883, to December 31, 1891. (*Lancet*, March 5, 1892, p. 523). For hip joint amputations for injuries, six cases, 50 per cent mortality; amputations done for disease, 14 cases, 28.5 per cent mortality.

Richard Davy, F. R. C. S., surgeon to Westminster hospital (*Lancet*, March 12, 1892, p. 570), gives a summary of ten cases with two deaths, 20 per cent mortality; these cases were all done for disease, chiefly persisting necrosis resulting from morbus coxæ. I believe, therefore, that the mortality after the gradual dissection method is the lowest for any series of five mixed cases, that is for injuries or disease; and I believe four of the cases would certainly have died by any other method of operating, not even excepting Wyeth's. It seems to me in desperate cases, where every dram of blood counts, a fatal objection to Wyeth's method is the capillary oozing which invariably follows the use of Esmarch's band applied as tightly as it must be to control the hemorrhage at this region. Besides this there is danger of overlooking small arteries, which in very weak patients are apt not to bleed immediately after the constriction is removed, but are apt to bleed after the patient is put to bed.

An important point a surgeon has to determine in cases of severe crushes of limbs is whether the amputation shall be done soon after the case reaches the hospital, during the partial continuance of so-called "shock" (acute anæmia), or whether he shall wait until the patient is recovered from the immediate effects of the injury as far as practicable. In the light of my experience I unhesitatingly recommend waiting. In this day of asepticism and Esmarch's tourniquet there is almost no danger in waiting and usually great gain, frequently the saving of a life. It is my custom to thoroughly wash, shave, disinfect and encompass the injured limb in aseptic dressings after applying the tourniquet just above the injured part. The tourniquet should be applied over the crushed tissues, if the circulation can be controlled in this way, and the tissues not so badly comminuted that they do not part under the pull of the band. If practicable it is best, after careful disinfection, to put on large aseptic pads over the crushed tissues, and then apply an Esmarch's bandage over all to just above the injured part. With this arrangement the amputation may be deferred twenty-four, thirty-six or forty-eight hours if necessary for the first effects of the acute anæmia to be relieved.

STATISTICAL TABLE OF AMPUTATION.

SINGLE MAJOR AMPUTATIONS.	NO. OPERATIONS.	DIED.	HOPELESS.
Amputation of arm	24	2	0
Amputation of forearm	32	0	0
Amputation of foot—Pirogoff	1	..	..
Amputation of foot—Hays	2	..	..
Amputation of foot—Chopark	5	..	..
Amputation of foot—Symes	8	..	..
Amputation of leg	90	1*	3
Amputation of thigh	72	16	10
Amputation of hip joint	5	1	0
Amputation of knee joint	14	2	0
Amputation of shoulder joint	10	1	0
	264	27	13

DOUBLE MAJOR AMPUTATIONS.	NO. OPERATIONS.	DIED.	HOPELESS.
Amputation of one arm at shoulder joint	1	1	1
Amputation of both arms	1	..	..
Amputation of arm and leg	1	..	..
Amputation of both forearms	1	..	..
Amputation of forearm and shoulder joint	1	..	..
Amputation of both feet—Chopark	1	..	..
Amputation of both feet—Hays	1	..	..
Amputation of foot—Chopark, and of leg	1	..	..
Amputation of both legs	5	2	2
Amputation of one leg and knee joint	2	..	..
Amputation of one leg and Symes—foot	2	..	..
Amputation of one leg and exsection ankle joint	1	..	..
Amputation of one leg and of thigh	5	3	1
Amputation of both thighs	3	1	1
Amputation of one thigh and all toes of other foot	1	..	..
Amputation of one thigh and ankle joint	1	1	1
Amputation of one thigh and operation for compound comminuted fracture of other leg	1	..	..
	29	8	6

TRIPLE OPERATIONS.	NO. OPERATIONS.	DIED.	HOPELESS.
Amputation of thigh, other leg and one arm	..	2	..
Amputation of one thigh, other foot and operation for compound comminuted fracture for right humerus	1	..	..
Amputation of thigh, arm and half other hand	1	..	..
Amputation of thigh, leg and operation for extensive laceration of scalp	1	..	..
Amputation of thigh, arm and operation for extensive laceration of scalp	1	..	..

QUADRUPLE OPERATIONS.	RECOVERED	DIED.	HOPELESS.
Amputation of leg, thigh, half of one hand and operation for extensive laceration of scalp and forearm.	1	..	..

* Pyæmia when admitted.

CHAPTER X.

ANÆSTHETICS.

Local Anæsthesia.

[By Alexander J. Mullen, Jr., A. M., M. D., Michigan City, Ind.]

The fact that the question of anæsthesia is attracting attention and discussion from the great medical and surgical bodies of the world is prima facie evidence that something connected therewith is radically wrong; that a great abuse is being perpetrated, or that the processes of substitution are inefficient. The cry of reform is popular and specious; decidedly so when there is something to reform. It is not within the province of this paper to dilate upon the dangers concomitant with anæsthesia so freely, promiscuously and unhesitatingly administered in the present era, but I shall endeavor to indicate cases where local anæsthesia obtains.

From early boyhood I have been familiar with the use of ice and salt and ice and the chloride of ammonium as a local anæsthetic. My father, Dr. A. J. Mullen of St. Louis, has been an enthusiast on the subject since the the year 1845, at which time he first became acquainted with the anæsthetic properties of ice and salt. In the winter of 1845, at Napoleon, Ripley county, Ind., several boys were sitting around the stove. A wager was made that not one of them, with the privilege of sitting as near a hot stove as desired, could stir a cup of snow with his finger until the snow melted. The wager was accepted; in a short time the young man became alarmed; the snow refused to melt. Dr. Mullen found the boy's finger as white as sperm and frozen stiff. The finger was so deeply frozen that its loss was prognosticated. The small blade of a pocket knife was inserted to the bone of the finger—the patient perfectly insensible of the fact. Application of snow water brought on a reaction in a few minutes, leaving the finger normal. One of the boys confessed to having put a spoonful of salt into the cup when he went after the snow.

Appreciating the value of the freezing process to surgery the doctor began its practical use a few days after by painlessly opening a mammary abcess. Since that time he has used ice and salt in innumerable cases, and in no instance had untoward results.

He reports the following unique experience:

In December, 1847, he was preparing to operate on a hernia that had resisted taxis. A piece of ice, concaved to adapt itself to the tumor, was faced with salt and applied; the ice was overlooked and permitted to remain longer than intended. A considerable portion of the abdomen was found frozen.

To the delight of the operator, the patient and his friends the hernia had disappeared. The peripheral constriction, through the process of freezing, had forced the intestine through the ring.

In 1873, at the St. Louis city hospital a prominent surgeon of St. Louis was induced by Dr. Mullen to perform a perineal section for stricture by freezing; the operation was a complete success.

In 1876, at Louisville, Ky., a large malignant growth was removed from the left shoulder of Miss F., age nineteen years; six months previous the late Professor Richardson, of the Louisville University, removed a malignant growth from the same shoulder; its rapid return necessitated this secondary operation. Ice and salt were applied locally; incisions elliptical, each seven inches long; wire sutures used; compresses saturated with whisky and water applied; wound healed by primary union. Professor Ouchterlony, of Louisville, Ky., knew of this case. The operation was painless except the saturing, when the patient said the pain was slight. I heard from this patient two years ago, and there has been no return of this disease—an interval of fourteen years.

At the Edinburg Royal Infirmary, in 1876, the doctor performed a secondary amputation of the thigh by ice and salt anæsthesia. Dr. Anandale, who was present, pronounced it a most humane procedure. In this case a block of ice of sufficient size was sawed in two parts. and each piece concaved by being pressed against a hot stovepipe, and thus fashioned to conform with the leg. The ice was then faced with salt and applied. At a dinner given shortly after Dr. Anandale demonstrated the anæsthetic properties of ice and salt to a number of medical gentlemen by subjecting a part of his arm to freezing. The plan was new to them.

The following additional cases, selected from among many, not only go to demonstrate the feasibility of ice as an anæsthetic but dissipate all ideas as to its evil effects:

In September, 1880, I removed an enormous tumor from right pectoral region of George W., colored, age 25, weight 200 pounds; parts frozen by ice and pulverized chloride of ammonium. Two incisions, each eleven inches long, were made. The wound healed by primary union. No bad results. Mr. F. W. Woodson, now a prominent citizen of Michigan City, assisted. Dr. J. T. Wood of Toledo, Ohio, was cognizant of this procedure.

In September, 1881—Miss M.—I amputated breast for malignant growth—ice and salt used. Incisions elliptical, each seven inches long; wound healed by primary union. Heard from this patient last week, nearly eleven years after; patient in good health; no return of disease.

In April, 1887—Mrs. R.—age 65 years; malignant breast; amputated same; ice and salt used; healed by first intention; no return of trouble and no bad effects. Patient died last January from the prevailing influenza, five years after removal of breast.

On Nov. 16 last year—1891—I removed two breasts; both for cancerous disease; Miss McK. of Lafayette, Ind., Mrs. R. of Michigan City, Ind.; ice and salt in each instance; anæsthesia complete; both wounds healed by primary union. A happy coincidence was that I was obliged to apply dressings in each case but three times after operating. The patients in all cases recline upon the operating table with towel over the face. Ice and salt used exclusively. No complaint of any kind or character was made by patients.

Dr. W. R. Godfrey of Michigan City, Ind., and Dr. H. E. Mullen of Hammond, Ind., rendered valuable assistance at all the foregoing operations.

I have used the freezing process successfully in anal fissures, hemorrhoids, hydrocele, removal of ingrowing toe nails, of small and large tumors, amputation of fingers, for necrosis of tibia, humerus, of ribs and frontal bones and for hernia.

During the forty-seven years that Dr. Mullen used ice as an anæsthetic and in the fifteen years of my own experience not a single case of blistering, exfoliation of skin or injury of any kind resulted.

The use of the ice is a simple process, but requires tact; every case being peculiar to itself. After being fashioned to adapt itself closely to the parts to be operated upon the ice is faced with fine salt or pulverized chloride of ammonium and held in the hand by a cloth; the more closely and firmly it is pressed to the part the sooner the freezing. From one to two minutes is required to accomplish this end; occasionally a re-application of salt is requisite. The method inculcated by Mr. J. R. Arnott of London, by which two parts of ice and one part of salt are pulverized separately, then mixed and applied in a bag, is tedious and bungling. The late Prof. S. D. Gross condemned that plan of producing local anæsthesia. In a monogram on "Progress in Surgery" the late Prof. William B. Hazard of St. Louis, in speaking of local anæsthesia, refers to "Dr. Mullen's method of ice faced with salt, superior to all others."

In conclusion I will say positively that operations of considerable magnitude can be safely and painlessly performed by this method. I urge the surgeons of this assembly to throw aside all prejudices and theoretical anomalies pertaining to this question. Do not fail to put this idea into practical use. Have no fear of bad results. Give the method a fair, thorough and impartial trial; then report the outcome of such experience at our next meeting or through the columns of our journal. This done, I assure you that in one year many enthusiastic disciples will be found to advocate the use of ice anæsthesia.

Chloroform or Ether?

[By D. W. C. Wade, M. D., Holly, Mich.]

This paper is written to compare the two agents that nearly hold a monopoly of the anæsthesia required in surgery in a manner that will develop something new, although the statements will be too familiar to necessitate references to the literature of the subject.

Chloroform is much more used as an anæsthesia than ether, and I think it is an interesting study to determine the probable reasons why this is so. Let us briefly examine the properties of chloroform, which will doubtless throw some light on the subject. Chloroform is a liquid capable of being rapidly volatilized and of producing any desired degree of anæsthesia when inhaled, well diluted with air. It has not a disagreeable odor and is therefore not unpleasant to the patient. It needs only a napkin from which to secure the change from liquid to gas, because a concentrated vapor is not required. For these reasons it is not difficult to secure the desired effect, and so it puts the anæsthesist to a minimum of trouble. It is pertinent then to inquire why any other anæsthetic should receive attention. It is not positively known how chloroform produces anæsthesia, nor am I interested in propounding a theory on the subject. But it is known by all that chloroform produces anæmia of the nerve centers, including the cardiac ganglia, and that it is capable of producing death by arresting the action of the heart when administered to an extent which it does not require skill or effort to do, but does require skill and effort not to do. It is further true that skill and effort are not always equal to the task of preventing death from chloroform; as there may not always be knowledge in advance of the impressibility of a heart's nerves to the action of this agent. Were chloroform entirely safe in skilled hands it is my opinion that its qualities would conform to all the practical requirements of a fastidious surgeon. And were it safe in unskilled hands it would be regarded as theoretically perfect and nothing would be sought to take its place.

Ether is inflammable, more volatile than chloroform, pungent, and therefore not agreeable to the patient. It requires a concentrated vapor to produce anæsthesia and cannot be successfully administered upon a napkin. Full anæsthesia can be readily produced by the use of a cone and a large quantity of ether; and the conclusion would easily be reached that it is not an ideal anæsthesia. But ether does not deplete the nerve centers, does not produce pallor, and does not lessen the strength of the heart's action. On the contrary ether produces a stronger pulse and sends an increased amount of blood to the centers that control organic life. I have no doubt that 90 per cent of the surgeons present at this meeting give their preference to chloroform, and that they do so on account of its positive, agreeable and convenient qualities. It is interesting to note that the advocates of chloroform as an anæsthetic assume positions that appear much on the plane of a defense for not choosing a safer method, and I must say that in all the literature I have ever seen in support of chloroform the writer has always taken the pains to say that in all cases the services of an expert chloroformist must be obtained, after having taken pages to explain the entire safety of this anæsthetic. I have never known a surgeon to carry himself on the side of chloroform but he was sure to quote himself for authority, having had a large experience without fatal results. I submit that such is not a proper argument, for it is perfectly well known that chloroform numbers many victims every year, several cases being annually reported in my state. Why do surgeons adhere to chloroform and attempt to evade the real reason for so doing when such a course is not consonant with the genius of our profession? It is to be supposed that no interest is to be considered but that of the patient, and that no short cuts are permissible for the convenience of the surgeon. I think I can solve this problem in this way. The surgeon has not been provided with satisfactory means of substituting ether for chloroform, and it is to be presumed that when so provided he will promptly abandon chloroform. Should an appliance be devised for the administration of ether that would be capable of furnishing any desired concentration of vapor with no waste of material, holding enough of the anæsthetic for a prolonged operation without exceeding a convenient size, its operations being automatic, and its efficiency under all circumstances being certain, I am confident it would meet with a favorable reception from every progressive surgeon. I have the pleasure of showing an instrument, modifications of which I have used continuously for seventeen years, that possesses the qualifications I have mentioned, and which is not too complicated to be easily comprehended. It can be made by any good mechanic under your own supervision. The ether is vaporized by the air to be inspired, the ratio of admixture being regulated accurately by a check valve. Ether is administered for me with this instrument by laymen and women and inexperienced physicians for the most serious capital operations, and it has often occurred that in case of abdominal suction lasting one to three hours the pulse has been better at the close than at the beginning. I am sure it is proper to add that the dilution of chloroform with alcohol or ether or both lessens the probability of a rapid administration of the anæsthetic, but there is no reason to suppose that these diluents take any part in the production of anæsthesia, as may be readily determined by leaving the chloroform out. Nor do they apparently delay or prevent the toxic effect of chloroform, which is fully confirmed by the reports of fatalities.

The instrument I have shown can be afforded when made in quantities at about $9.00, and leave a moderate margin to the manufacturer. Any orders to me will be turned over to an instrument company to be filled.

CHAPTER XI.

ANTISEPTICS.

Aseptic and Antiseptic Methods in Railway Surgery.

[By Ocsar J. Price. M. D., Surgeon for Chicago & Alton R. R. and Cook County Hospital, Chicago.]

It is presumed that the surgeon of to-day is familiar with the principles and experimentally adept in the application of aseptic and antiseptic methods. And yet no apology is believed to be necessary at this time and place in emphasizing their importance and in reviewing the various steps necessary to be taken in complying with their observance.

Since the almost divinely inspired Lister gave to the profession the grand principles for the preservation of organic matter, other able and brilliant men, notably Koch, Rosenbach and Bergmann, have followed in his footsteps and elaborated his doctrines, until the literature of the subject is quite extensive and complete.

It is the aim of this paper to condense and classify some of the principal factors and rules of action which have been found necessary to secure the best results in the observance of these principles and doctrines.

It may be stated as a general proposition at the outset that a careful and strict observance of aseptic methods in the treatment of an aseptic wound, affords an almost absolute guarantee in preventing suppuration, and if it is not accomplished the fault is ours.

Surgery demands, then, a careful study of its principles and a rigid adherence to its methods. As a matter of fact the railway surgeon must and will have to do his work not unfrequently under the most unfavorable circumstances and surroundings—by the dusty roadside or upon the floor or bench of the station house he will often find his patient, presenting a condition which calls not only for his prompt attention and care, but for good judgment and the most careful circumspection.

If he proceed hastily or carelessly at the outset, septic germs may be introduced, which will not only add very much to the difficulties of subsequent treatment, but not unfrequently become the means of fatal termination.

If his curiosity gets the better of his judgment, or acting under the impulse of the moment, with a desire to render as prompt and thorough treatment as possible, he thrusts his fingers into the wound, or a probe is inserted, without having first prepared the parts to be examined, as well as his hands, the chances are very much in favor of his introducing an element of mischief, possibly greater in its injurious effects than the damage already sustained.

With very few exceptions, such as accompany lacerations of large blood vessels, followed by dangerous hemorrhage requiring immediate constriction and control, there need be no especial haste in bestowing the attentions which the case demands. (And just here I would like to make a suggestion as to the desirability of having all railway employes, especially conductors, brakemen and porters, drilled the same as policemen in our cities, to meet emergencies, stop hemorrhages and apply rude temporary antiseptic dressings. To this end a chest containing necessary dressings and tourniquets should be upon every train).

Having quieted the patient's sufferings, if much, by an appropriate anodyne, the surgeon may proceed in a deliberate manner to fulfill the conditions, as nearly as he may be able, whereby the wound shall be treated according to aseptic methods.

He will not have the facilities of a hospital at his command, and no doubt many times his ingenuity will be sorely taxed in carrying out the necessary *minutiæ* for the protection of the wounded member until more careful measures can be instituted.

To this end iodoform powder may be dusted freely over the parts; a clean towel wrung out of hot water, or a dry one, to which has been added a 5 per centum of carbolic acid, or freely dusted with iodoform, may be placed to surround the wound; or what is still better, if at hand, a temporary dressing of bichloride or carbolated gauze and iodoform. This, with appropriate support, such as splint and bandage, will enable the surgeon to convey his patient to more suitable surroundings, to his home or a hospital, where better conveniences can be had for the further treatment of the case.

There can *now* be little excuse for omitting any details of aseptic or antiseptic methods, which through such omission might entail the loss of life or limb later on.

If the parts are presumably aseptic it should be our next careful endeavor to *keep* them so. It has been demonstrated time and again that a large proportion of incised and lacerated wounds, and indeed many compound fractures, as well as gunshot wounds, are aseptic.

How great the responsibility, then! How carefully should each step be taken, lest we become the means or the instrument of septic infection, with its fearful accompaniment of inflammation, suppuration, pain and elevated temperature, more or less destruction of parts and not unfrequently terminated by death itself.

If we are familiar with the handicraft of asepticism and can command a clear comprehension of its principles, with a ready application of its technique, we shall, on the contrary, be enabled to avoid much or all of these consequences and accomplish a restoration of normal conditions, even when the parts have been mangled to a pulp and otherwise beyond hope of saving.

It is said that "cleanliness is next to godliness," and certainly it is the watchword and *sine qua non* of modern surgery.

HANDS AND PARTS.

As a first step the operator's hands should be made surgically clean; the finger nails carefully attended to, all rings removed, and both hands and fore arms thoroughly scrubbed with warm running water, potash or green soap, and clean sterilized brush. Then 95 per cent alcohol is poured upon them, after which 1-1000 solution bichloride of mercury is used, followed by sterilized water.

The part to be operated upon is also carefully scrubbed, shaved, scrubbed again, bathed or irrigated for a short time with a sublimate solution 1-3000, and finally bathed for a moment with strong alcohol preparatory to operating.

When time admits, the method employed at Johns Hopkin's hospital may be adopted, to-wit: The field of operation to be soaked for several days in advance with wet dressings and green soap, which softens up the cuticle and inspissated secretions. The night before operating scrub again with green soap, shave in alcohol 95 per cent, then bathe successively with ether from ether can, 1-500 solution of bichloride, 5 per cent carbolic, rub in sterilized iodoform, and finally apply an occlusive dressing.

Various solutions may be used for the hands, those most to be relied upon being corrosive sublimate 1-1000, carbolic acid 2 per cent and alcohol 95 per cent.

In Cook County hospital of late it has been the custom in the more important operations, after the use of alcohol to immerse the hands successively in a saturated solution of permanganate of potassium, saturated solution of oxalic acid and a mild solution of hypo-sulphate of soda, followed by sterilized water.

The hands having been once prepared both as regards the operator and his immediate or first assistant, they should not be allowed to come in contact with anything but the parts involved in the operation, the instruments, ligatures and sponges. This will require great thoughtfulness and care, and is of the most vital importance.

It will not do for the operator, or his first assistant, to divide his attention with the anæsthetizer, as for instance, if the patient struggles to catch hold of an arm or other parts of the body with a view to assisting him, and if it must be done the hands should be again prepared ere proceeding.

ROOM.

Some attention should be paid to the condition of the room, which should be well lighted, ventilated and dustless as possible and free from carpets and clothing.

BASINS.

Porcelain or earthen basins, boiled in 5 per cent carbolic acid, should be placed conveniently by, containing antiseptic solutions of suitable strength for the frequent immersion of the hands.

IRRIGATION.

A fountain syringe or ordinary syphon tube of rubber, previously boiled in 5 per cent carbolic acid, may be made the vehicle for conveying the irrigating solutions, of which several large bottles full should be close at hand for resupply in case of need.

SPONGES.

The best sponges are those made of medicated gauze, previously cut into convenient sizes and placed in an earthen or porcelain dish, and covered with a clean towel. Sea sponges I have not used for years; they may sometimes be desirable, as in abdominal section, but when employed great care should be exercised that they be thoroughly cleansed by frequent washings, and preserved in 3 per cent solution of carbolic acid; once having been soiled with pus they should not be used again.

In one of the hospitals in Chicago where special attention to antiseptic surgery has been given for several years, absorbent cotton is used for sponges, which is rolled into bunches of suitable size and then wrung out of boiled water just before using, and applied dry or nearly so.

TABLES.

Improvised kitchen tables covered with a clean quilt and rubber cloth, answer admirably for the operating table; close at hand a smaller table should be placed, on which are arranged the instruments, ligatures, needless, dressings, etc., which may be needed.

A common mistake is to select more instruments than are used, thereby multiplying the duties of the attendant and often confusing him or her in the prompt selection of the ones required.

INSTRUMENTS.

The instruments having been selected should be disarticulated, scrubbed with green soap, wiped and folded in a sterilized dressing and boiled for twenty or thirty minutes in a 5 per cent solution of carbolic acid; once clean, kept clean, and finally placed in a 2 per cent solution bath of carbolic acid, or wrapped up in a clean towel dry, ready for use in a suitable tray.

It is well to have them arranged in systematic order; all the artery forceps nicely arranged together in one tray, with the knives, retractors, scissors and dressing forceps properly classified in another, while in a smaller basin can be placed the needless and ligatures.

LIGATURES.

As to the methods of preparing the ligatures the silk should be wound on glass slides similar to those used for microscopical work, but not wound thickly; these are boiled half an hour for three successive days, and then kept in sterilized alcohol in sterilized glass jars for use. Before the operation they are boiled in 5 per cent carbolic acid solution, or sodium carbonate, but not with instruments or needles for fear of discoloration.

Silk worm-gut—Boil thirty minutes and keep in a sterilized receptacle containing 1-1000 bichloride; infection does not travel along it save with great difficulty.

Cat-gut—Scrubbed in absolute alcohol after scrubbing in green soap; put in oil of juniper for three to four days, then immersed in ether three to four hours, then in 1-100 alcoholic solution bichloride, for a day or two, and kept ready for use in 1-4000 alcoholic sterilized solution of corrosive sublimate.

DRAINAGE TUBES.

Those made from decalcified bone are the best, and are usually absorbed by the tenth day. If rubber drainage tubes are used, they should be boiled two hours, scrubbed to remove sulphur (white) coating, then boiled two hours and kept in alcohol.

Mason's glass fruit jars of various sizes make convenient receptacles for this purpose, and for carrying in satchel. Capillary drains of silk, or better, cat-gut, answer admirably for small wounds.

GUAZE.

The gauze intended for dressings should be of undoubted quality and always kept well wrapt in waxed paper and preserved in cans, or preferably, sealed glass jars, as it soon becomes worthless by exposure. It is well to have it cut into suitable compresses, which must be ample to entirely envelop the wound, and placed folded in a clean towel, a little removed from the field of operation.

ABSORBENT COTTON.

By it, it is well to have absorbent cotton for the outside dressing, roller and starched bandages, safety pins, etc.

By having everything thus arranged in advance, avoids confusion and prevents disappointment of finding some important article wanting when it is most required. These may seem little things, familiar to all, but it is nevertheless in the careful observance of the little things that brings triumph and success to the painstaking surgeon.

ASSISTANTS.

The arrangement of the assistants also is a matter of no small importance and should not be entered into indifferently or without a due regard for the qualifications of each for the place selected. In the Presbyterian hospital, Chicago, where I have occasionally had the pleasure and satisfaction of operating, there is but one person, a painstaking trained nurse, who handles all the instruments, needles and ligatures, with the greatest care *directly to the operator*.

APRONS AND TOWELS.

Having thus carefully prepared the parts, arranged the instruments and dressings, all persons who are to take part, are duly protected by clean freshly laundried aprons. A good supply of sterilized towels at hand, some of which have been wrung of a bichloride solution 1–500, are placed around and about the part to be operated upon.

The operation may now proceed, but with the greatest care and thoughtfulness lest in an unguarded moment, either the operator or his assistants should violate some one or more of its essential conditions, and thus jeopardize all that has been done.

As few hands as possible should come in contact with the parts being operated upon; curiosity to see and feel, by assistants or others, should be granted only when absolute precautions as to aseptic hands have been fully complied with and even then should ordinarily be refused.

The hands of the operator alone should as a rule be relied upon as much as possible.

HAIR AND WHISKERS.

In operations of much gravity and magnitude, it is well to envelop the hair of operator and immediate assistant with a gauze cap or turban. Almost unconsciously the hand may be carried to the brow, whiskers or hair, to remove perspiration, which would be unfortunate, and should necessitate the renewal of the scrubbing process already mentioned, ere proceeding farther. It not infrequently happens that the most careful operator and his first assistant rub their heads together over the field of operation until dandruff and hair fall into the wound. This could hardly be detected except by a person not absorbed in the active part of the operation. Should a towel become soiled by vomit or otherwise, it should be at once replaced by a clean one.

When these rules are intelligently observed and conscientiously followed, little or no fever may be expected to follow the operation, with very little pain and discomfort generally, and the most satisfactory results as a reward for the effort made.

In closing the wound with sutures, it is desirable to bring the surfaces as closely in apposition as possible, that there shall be no tension, raw surfaces or dead spaces. The attitude of the patient with reference to the injured part to be taken into consideration with a view to *gravity*.

DRESSINGS.

The dressings employed should consist of iodoform and bichloride or carbolated gauze. Absorbent cotton, wool or wood wool wadding treated with corrosive sublimate, are all very useful dressings. The ideal dressing being *soft, absorbent* and *elastic*.

After amputations small compresses or strips should be placed on either side of the wound, some little distance from the edge, so as to press the deeper parts well together, rounding out all the interspaces by a nice adjustment of packing with fluff gauze and sterilized cotton; over all a soft, elastic bandage, taking pains to secure properly applied pressure so as to prevent the formation of a cavity in which fluid can collect, thereby checking the tendency to effusion, as well as assisting in the absorption of that which has taken place. If such dressings have been carefully adjusted, and all the conditions complied with, an amputation wound may often be left a fortnight or longer untouched, only two or three dressings being required in all.

AFTER THE OPERATION.

Having completed the dressings, *rest* should be insisted upon. If the injury has been considerable, the repose should be both general as well as local. This is physiological and in accordance with nature's plan of restoration, demanding quietude for a suffering or injured part.

Immediately after the operation is by far the most suitable time to clean and dry the instruments that have been used. They should be washed carefully in several changes of soap and hot water, and boiled for half an hour if exposed to pus, then dried out of water at nearly the boiling point the joints carefully cleansed and put away in clean towels or canvas cases. The addition of a tablespoonful of baking soda to the pint of water prevents the formation of rust.

AFTER DRESSING.

The dressings will be left or changed according to the conditions presented and the range of temperature. They should remain undisturbed as long as they are comparatively dry and inoffensive in odor, or *per contra*, should be removed promptly with the same care and cleanliness previously indicated, if there be much pain about the wound, chilliness or elevation of temperature, when a careful search should be made to ascertain the cause. If it should be found that the aseptic methods employed had after all miscarried, as evidenced by a swollen, red and painful condition, tending to suppuration, we have then to deal with septic processes, and must promptly employ the most positive and thorough antiseptic methods in combating the mischief, and preventing the further spread of the germs that have developed.

Asepsis having been merged into sepsis, it remains to consider what the methods are. Two of the leading factors contributing to this end are embraced in *disinfection* and *drainage*.

Let us assume that in addition to the inflamed, swollen and painful condition of the wound spoken of, we also find it gaping at different places, the skin angry and painful, and its surfaces presenting a grayish diphtheritic appearance, with pus exuding; a condition which upon investigation we find extends throughout the wound.

ANTISEPTIC METHODS.

Under such circumstances all stitches should be removed, a probe or director gently inserted, until the surfaces are separated sufficiently to admit the finger, when gentle pressure is made throughout, and the wound thus opened up to inspection, irrigation and drainage.

This will consist of free douching with warm bichloride solution (1-2000), followed by sterilized water, and gently packing with 10 per cent iodoform gauze, over which is placed the usual dressings already mentioned, with the addition of a piece of rubber tissue placed external to all, with a view to preventing evaporation and keeping the parts moist; or, the method advised by Professor Senn, in his admirable work on the "Principles of Surgery;" of curetting flabby granulations, and the application of a 12 per cent solution of chloride of zinc, and washing away any surplus fluid by sublimate solution previous to dressing, or in the case of extensive burrowing of pus along deep tissues, constant irrigation with a saturated solution of acetate of aluminum, until the wound has been rendered aseptic, when the usual dressing is applied.

Such dressings may be left on only so long as presenting evidences of being in a cleanly condition, being changed as soon as soiled through or giving a bad, offensive odor.

This process will ordinarily be sufficient to change in a short time all the systems for the better; the temperature should fall, the pain decrease, the appetite be restored, and sleep and rest secured.

If such favorable conditions do not follow and the temperature continues to be elevated very long, it is likely that the parts have not been fully laid open, and that some small recesses or *foci* containing pus remain, which must be searched for, opened, and a gauze packing or drainage tube inserted, the aim being always to secure a thorough cleansing, free antiseptic irrigation, and the most ample drainage. Here an excellent agent for searching out pus and thoroughly cleansing wounds, is the per oxide of hydrogen, which may be injected freely into the sinuses or pockets, and followed by the tincture of iodine (full strength or reduced), an agent which has given the best of satisfaction in my experience, being non-toxic, a good stimulant to granulations, although I have found it occasionally to irritate the skin.

Having thus glanced over the general field of aseptic and antiseptic methods at our command, it is well to consider for a moment the contraindication which will frequently be met with where their application is of doubtful utility and may do more harm than good.

Cases where irrigation with antiseptic solutions enumerated become superfluous and irritating, developing eczenatous conditions, with serous exudates, and really retarding the healing process.

Reference is made more especially to clean incised wounds of an aseptic character, where, by perfect cleanliness and irrigation with sterilized water alone, the amount of exudate is reduced to a minimum, and the wound left in the best condition for primary union, profuse wound secretections being always in danger of infection.

It may be well to mention in this connection the action and the contra-indications for the use of some of the antiseptics we employ, as corrosive sublimate, which is very effectual as a germicide, but has many drawbacks; 1-1000 is sufficient for general purification, 1-5000 or 1-10000 for irrigation; but should be followed by sterilized water to wash away any excess and prevent possibility of poisoning. It should never be employed for large absorbing surfaces or extensive wounds in which there is reason to fear its retention. Salivation, dysenteric diarrhœa, vomiting, collapse and even death have been known to follow its use; it should never be brought in contact with steel instruments.

Lister has lately been experimenting with a double cyanide of mercury and zinc (of unknown composition) which may prove more effectual.

Carbolic acid possesses the advantage of being volatile, but it is by no means perfect. According to Koch, instruments to be absolutely pure should be left for at least two days soaking in a 5 per cent solution. One to forty is the ordinary strength for cleansing wounds, 1-20 for instruments, sponges, etc. It also distinctly tends to encourage oozing from wound surfaces, and excessively employed may cause headache, giddiness, extreme depression, with low temperature.

Iodoform has an objectionable odor, and has been followed by instances of absorption and serious poisoning, especially in the aged and persons where susceptibility depends upon individual peculiarities.

It may cause an erythematous rash in the neighborhood of the wound, or quite generally all over. Its beneficial effects are great, however, rendering the surfaces dry, tending to stop hemorrhages, and forming a crust under which repair takes place rapidly.

When poisonous effects are noticed, the symptoms are anorexia, headache, great depression, delirium and sleeplessness, with rapid pulse, cold surfaces, and great prostration.

It is excreted by the kidneys as an iodide, and it has been thought that poisoning only occurs where these organs fail in their functions, supposedly from some compound with albumen being formed.

All antiseptics injure the tissues more or less and increase the amount of fluid poured out. There will also be personal idiosyncrasies arising, where neither iodoform, carbolated or mercuric solution, will be tolerated, their use developing an inflamed surface of a painful character, with the conditions just enumerated, and where a further persistence with them would be harmful.

With such conditions presenting, what is generally understood as "dry dressings" should be employed, such as subnitrate of bismuth or boric acid powder, freely dusted over the part, using sterilized or boric acid water sparingly, when necessary to employ irrigation, and dressing with absorbent or borated cotton. In many superficial wounds, especially about the face, where it is not desirable to bandage, the careful cleansing of such, and dusting on of iodoform or bismuth powder, with a dressing of absorbent cotton in the form of a small compress, held in place by saturating the edges with liquid collodion, answers every purpose.

This will close what I have to say on the subject of methods or routine in antiseptic surgery; and I only further wish to add the necessity for the surgeon to always and at all times, keep himself as cleanly as possible, avoiding whenever it can be done the introduction of his hands into pus cavities, or unnecessarily coming in contact with soiled wounds.

I have attempted to give briefly the methods which have been followed in my experience, extending over a period of a good many years in private practice, in railway surgery and in hospital.

In no instance has there been occasion to doubt the efficacy and saving efficiency of the methods enumerated, apparent failure being always traced to some violation of its principles during the time of operation, or through the carelessness of patient or attendant afterwards.

I regret that time does not permit to give a summary of many cases of various kinds and types in which these methods have been most satisfactorily demonstrated.

The experience and lessons thus derived, have convinced me more and more of the necessity of making the subject of antiseptic methods more thorough and explicit as to detail and minutiæ, realizing that it is owing to the non-observance of some one of them, that good results are jeopardized and failure made possible, that it is comparatively easy to *prepare* properly for an operation, but extremely difficult to maintain the same precaution and care *during* and *after* the operation.

It is not claimed in this rather minute survey of methods to be employed that anything especially new has been added to the subject which is not more or less familiar to all surgeons, the intention being rather to glance over the general field of aseptic and antiseptic methods in vogue, to classify and condense those which have been found to be most practicable and reliable by the test of considerable experience, and to arrange their detail and application in such a manner, as to be of daily use to the wants of the railway surgeon.

It must be admitted that we have not yet reached and probably never will reach perfection in the methods employed; we may do too much, we may do too little.

The remedies at our command are not as yet ideal ones, and like all other things earthly, are not always fraught with perfect results.

It must become a question of *individual judgment* on the part of the surgeon, as to what particular method should best be employed, or as to what antiseptic should be used, keeping in view always the grand principle of cleanliness and protection from germs, aiding nature in her wise endeavor and casting no stumbling blocks in her way.

Caution in Regard to the Use of Bichloride of Mercury in Wounds.

[By Samuel Birdsall, M. D., Susquehanna, Pa.]

Bichloride of mercury is the most potent of the germicides used in surgical practice. It promptly destroys all forms of disease germs; is convenient and inexpensive. Possessing such properties it is not strange it should be used with the utmost freedom to render wounds aseptic. I myself used it freely in all my operations and for irrigating wounds, etc., for five years from 1886 to 1891.

Incised wounds so irrigated and dressed with iodoform gauze, bichloride gauze and bichloride cotton healed promptly by first intention. During this period I performed quite a number of amputations and many minor operations. Most of the cases remained under my care until recovery In no case was there suppuration to any considerable extent; no erysipelas; no pyæmia. The results so far as these various conditions are concerned were all that could be desired. Having, however, practiced surgery before the days of antiseptics, and recollecting that I had in many cases, though not so uniformly, secured just as good results, I began to consider: First, whether the use of bichloride of mercury was necessary in the treatment of wounds, especially recent or non-septic wounds; second, whether the use of the bichloride is free from harmful results.

With the introduction of antiseptic surgery numerous changes were made in the treatment of wounds. First, and perhaps the most important of all, the surgeon's hands are thoroughly cleansed and rendered aseptic by the free use of bichloride solution or some other germicide.

Surgeons have now fully recognized the necessity of rendering all the instruments used in operations, as well as the hands, entirely aseptic. Iodoform was at first freely applied to wounds, either in the form of the powder or gauze, or both, and is still used by many surgeons. Bichloride gauze formed the next layer of the dressings, and lastly a thick layer of bichloride cotton before the retentive bandage. The Lister protective also, outside the bichloride cotton, has been quite generally but not uniformly used.

The most important change, however, is yet to be mentioned. The silk ligature, for the permanent control of hemorrhage, left long and drawn out at one angle of the wound, not only seriously interfered with the healing of wounds but was a fruitful source of blood poisoning, with resulting gangrene, erysipelas, etc. The silk ligature was a great improvement over former methods, but, viewed in the scientific and practical light of the present, it seems strange to us that it should have retained its place, as it did. for 225 years. The adoption of the catgut ligature can hardly be claimed as a part of antiseptic surgery or a result of the investigations which led to it, but as a fortunate change coincident therewith. The silk ligature is, I believe, still used by some surgeons, but not as heretofore. It is now cut short and buried in the wound. Without this change in ligatures modern antiseptic methods would be deprived of half their value. All these changes having been made in the treatment of wounds, how is the clinical observer—the general practitioner of surgery—to know how to correctly estimate the benefit derived from irrigation of wounds with bichloride of mercury, and how much of the superior results should be attributed to the improved dressings and the other changes to which I have referred? The bacteriologist would probably tell us that bichloride irrigation and the antiseptic absorbent dressings both are alike necessary. The clinical observer might, however, still entertain doubts as to the correctness of such teaching. In regard to the possibility of injurious results from the too free use of bichloride of mercury in wounds, I desire to state that I was at first so pleased with the grand results of antiseptic surgery that I was slow and reluctant to believe that any harm could result from the bichloride irrigations. The strength of the solution I ordinarily used was 1-2000 with an equal amount of ammonium chloride. I never used a stronger solution than this in recent wounds. I soon noticed that frequently, but not invariably, patients suffered more pain after operations than before bichloride irrigations were used. Sometimes anodynes were required for only a few days, but occasionally they were needed at intervals for weeks. I was careful to retrench all nerve trunks that could be found, so that they could not be caught in the cicatrix. Notwithstanding this precaution a neuroma developed in one case after amputation of the arm. The surgeon who had charge of the after treatment and performed the second amputation attributed the unfortunate result to injury of the tissues at the time of the accident. I had not met with any such result before and could not divest myself of the thought that possibly the bichloride irrigation had something to do with it. Observing the severe pain caused by the bichloride solution where patients were not under the influence of an anæsthetic, I first abandoned its use in such cases or used it very much weaker. There is scarcely a more delicate structure in the human body than the axis cylinitis and medullary substance of a nerve fibre. The wounded or cut extremity of every nerve exposes three delicate structures. The application of a powerful irritant like a 1-2000 solution of bichloride of mercury can scarcely fail to produce harmful results. I therefore decided to abandon its use, especially as I had learned that such a course would receive the sanction and approval of some whom we regard as authorities in surgical practice in certain quarters where a strong reaction was setting in against bichloride irrigations. For some time after forming this resolution I had only minor cases, such as amputations of fingers. etc. As a gently stimulating and detergent lotion I used a 1 per cent solution of carbolic acid with pure spring water for cleansing the wounds by irrigation. I observed the same good results I had previously obtained with bichloride irrigations. Union by first intention was the rule. The comparative freedom from pain immediately after the operation and subsequently was a marked feature. Encouraged by these successes I pursued the same plan in a case of amputation of the middle third of the leg in a boy sixteen and a half years of age. I did not however secure the same good results I had in the minor cases. There was union by first intention for about three-fourths the extent of the flaps. In the remainder the union was delayed and considerable suppuration followed. The suppuration appeared chiefly along the track of the drainage tube, which was rather large for the size of the limb. The drain had, however, been thoroughly cleansed in bichloride solution just before using. Recovèry was more protracted than in the cases where I had freely used bichloride irrigations, but was nevertheless complete with a well formed stump. In reviewing the case I conclude that the suppuration and incomplete healing by first intention may have been due not alone to non-irrigation with bichloride, but there were other factors that should be taken into account. The patient had not only a crushed leg, but severe concussion of the brain and was in very low condition, necessitating a delay of ten hours before he had rallied sufficiently for operation. I was unable to obtain pure spring water, such as I had used in the minor cases, but was obliged to use river water. There were other circumstances also which need not be mentioned in detail, rendering it difficult to secure asepsis. Bichloride solution was freely used for the hands of myself and assistants, and for the integuments of the injured limb. The marked immunity from pain, however, was gratifying to observe. To say there was none would be claiming too much, but its diminished severity was in marked contrast with many of the cases where the bichloride irrigation had been freely used.

The next important case was amputation in the middle third of the thigh; patient, a boy twelve years of age. The circumstances in regard to the water I was obliged to use, and the conditions for carrying out antiseptic practice were the same as in the previous case. I therefore decided to use a 1-4000 bichloride solution. The large nerve trunks were carefully retrenched. The irrigation was just sufficient to thoroughly cleanse the wound before and after closing the flaps. The result in this case was highly gratifying. No anodyne was required after the first twenty-four hours, and there was but very little pain even then. The dressings were changed the seventh day and the drainage tube removed. The flaps appeared well united throughout, with no suppuration. The second dressings slipped, and as it was not until a week had passed that I could re-apply them the unsupported flaps separated at one point and slight suppuration occurred. Healing rapidly advanced, however, under the continued use of the dry antiseptic dressings and was soon complete.

A year ago, at the meeting of this association in Buffalo, I advocated the free and thorough use of 1-2000 bichloride solution in wounds and after operations not involving synovial surfaces or serous cavities. Further experience has convinced me that a solution of that strength is liable to do harm by injuring the delicate structure of the wounded extremities of nerves which are more or less exposed in nearly all the wounds the railway surgeon is required to treat. Therefore as a clinical observer I wish to offer my testimony and sound a note of warning against the too free use of strong solutions of bichloride of mercury in wounds. Antiseptic surgery is still in a transition state. Further observation and experience are needed to determine just what is best to secure the most favorable results. We are told on good authority (Hare's Therapeutics) that a bichloride solution of 1-50000 is sufficient to kill disease germs. If this is true why should solutions of excessive strength be used? I am free to admit that observation and experience since we last met a year ago have changed my mind and consequently my practice. I now use bichloride irrigations with extreme caution in recent wounds where injured nerves are exposed. I conclude, however, that unless boiled water or water of extreme purity can be obtained for cleansing wounds the use of bichloride solution is a necessity. Septic germs, which so readily find access to wounds and may be in the water used during an operation, should be destroyed; also bichloride irrigations and the antiseptic dressings are both required if we are to secure the best results.

I also conclude that bichloride solutions not exceeding 1-6000 to 1-4000 are harmless in ordinary wounds not involving serous or synovial cavities. It is probable, however, that still weaker solutions will be found efficient, and if so their use is to be commended.

CHAPTER XII.

SUPPLIES FOR THE SERVICE.

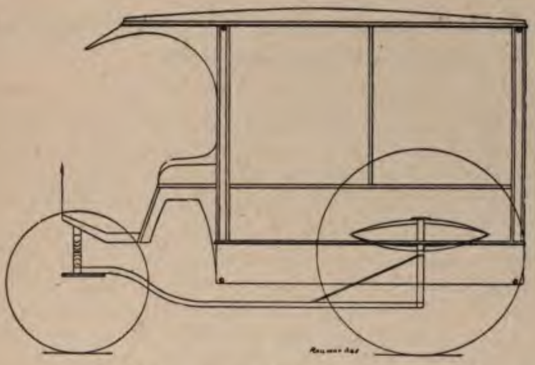
A Better Ambulance Service.

[By C. McV. Tobey, M. D., St. Paul, Minn.]

In this age of rapid advancement in all the arts and sciences, medicine and surgery have not fallen behind in demanding their full share of credit for the rapid strides they have made, as shown in the lower death rate and the higher number of recoveries in what until recently have been considered incurable cases. The public are only concerned in results, and they know but little of the slow and tedious trials, the repeated failures and the disappointments that have followed the earnest students in working out these results. That they are obtained by a combination of ideas adopted and put into form by some earnest, industrious student who is then lionized is the experience of the day. That it should be and is our endeavor to furnish ideas and to work for the alleviation of suffering and the restoration to health of the sick and injured is admitted. In the technique of the present day where so much is heard of aseptic and antiseptic treatment the patient is usually understood to be on the table, and but little reference is made and little thought given as to how he got there. If he was placed there from a hospital bed all well and good, because it is to be presumed that he was carefully handled.

But how is it with the patient who has been struck by a swiftly moving engine or caught between the deadwood or shunting cars? A leg, an arm and perhaps several ribs are found to be broken and the flesh badly mangled. Is it your experience that he is properly treated before being received into a hospital fitted for emergency cases? And how is it if he is carried into a home where room is scarce and proper accommodations not to be had? Is it any wonder that "died from shock" is the usual form on the death certificate? That "died from shock" is too general in its application can not be denied, and it would be interesting to know how many died from rough handling instead of shock. We shall only know, and then only approximately, when a system is adopted that will keep pace with other advances made which have done so much to lessen the ills of mankind.

To have an ambulance system that shall be practical and suited to every purpose is the one great thing to be desired, for the call often comes for ambulance service from the rich as well as the poor, and a stretcher that can be utilized as a bed and an operating table as well must be more practical than the system so general in all cities, which consists of only a strip of canvas and two straight poles. The objection to the latter needs no comment from me nor from any one who has ever seen the pain and suffering inflicted upon the patient shut up in this most objectionable thing. A stretcher should be so arranged that it can be handled without pain to the injured person, and particularly when a patient has been brought in on an engine or in a box-car from a distance of ten or twenty miles. Great difficulty is experienced sometimes in getting an injured person out of a narrow car door or off from the platform, but a cot on which the patient can be securely and safely fastened obviates all difficulties and reduces the suffering to a minimum. Such a stretcher permits of several uses, any one of which places it far ahead of the canvas, and when it comes to placing the patient in an ambulance the difference is unmistakably in favor of the cot. Your patient does not receive every jar and jolt of the wagon, nor does he lie upon the bottom of the box, but he has a spring bed beneath him which must lessen his suffering and thus tend to restore him to health much sooner. Recognizing the fact that the merit of a new drug or instrument is found only in its use, I leave it for you to determine whether you adopt the few suggestions offered or wait until something better comes along, and in the meantime put up with the present stretcher.



PLAN OF IMPROVED AMBULANCE.

Body six feet six inches by four feet two inches; track, front wheels, four feet eight inches; wheel three feet; track, rear wheels, five feet two inches; wheels four feet four inches.

A model has been constructed for an ambulance upon the following plan: The length, width and height are nearly the same as the ordinary wagon now in use for this purpose; the weight is less unless specially ordered. Its capacity greatly exceeds any in use except the Red Cross. It will carry six patients in a prone position, each resting upon a spring cot and upon a cot by himself, with air space of twenty inches between cots. The cots are to lie upon solid supports, two side by side, and, when in use, two above, two in the middle and two on the bottom. Those not in use can be kept out of the way in the top of the wagon. The cots can be used and are intended for a bed, an operating table or stretcher, and are each twenty-two inches in width and supplied with a rubber sheet and bedding. They can be put in place when loaded with two men by a link belt lifting apparatus, which is only used when more than two patients are to be carried. This is out of sight and out of the way, and in no way destroys the symmetry of the wagon. Wagons for four cots or stretchers are constructed upon the same plan as for six. The cost will not exceed the cost of other wagons made for this purpose and of equally good material and finish. For railway work an ambulance wagon of this capacity is often needed and frequently in city work, where the service is often limited to one wagon.

◆

CHAPTER XIII.

MISCELLANEOUS SUBJECTS.

An Experimental Inquiry Concerning Elastic Constriction as a Hæmostatic Measure.

[By N. Senn, M. D., Ph.D., Chicago, Ill.]

Mr. President and Members of the National Association of Railway Surgeons:

The principle of elastic constriction as a hæmostatic measure is an old one, and yet it required an Esmarch, who by his genius and influence has made this one of the most common and useful procedures in surgery. I shall simply, as a matter of demonstration this morning, point out to you as briefly as possible some of the advantages and disadvantages of this, now one of the most important and common procedures as a prophylactic and curative agent in the treatment and prevention of hemorrhage.

I have selected as a subject for my demonstration a gentleman who fortunately is so well constructed as to point out to you clearly some of the features which will enter largely into the discussion of this subject. He is a man with a minimum panniculus adiposus and a maximum of vessel development.

This procedure well deserves the term bloodless, and it was the aim of von Esmarch and his earlier followers to render the limb first completely bloodless by applying an elastic bandage from the periphery up to the point of compression. I will do this now and thus, under elastic compression, force from the limb all of the blood, rendering the tissues absolutely ischæmic. This is a preliminary step to the application of the elastic constrictor. The constrictors first used were usually pieces of rubber tubing large or small and sufficiently strong under the elastic pressure to interrupt the circulation. I have now succeeded in removing all of the blood supply to the limb under the elastic bandage. I apply the elastic constrictor just above the bandage. We will now remove the elastic bandage, and I am sure that if I have succeeded in obtaining a bloodless condition the limb will present a perfectly ischæmic condition. I have applied the elastic constriction in this manner for the purpose of pointing out two great disadvantages connected with this method of procuring a bloodless condition of the limb to be operated upon, or for the purpose of arresting hemorrhage. I call your special attention to the use of the elastic bandage, which I have discarded long ago as a preliminary step to elastic constriction, because the elastic compression which we have applied and now removed is one of the common sources of traumatic disseminations of malignant tumors and microbic diseases. If you apply an elastic bandage in operating for a malignant tumor there is great danger that under the elastic pressure some of the histological elements of the tumor will be forced into the surrounding tissues of the general circulation. This source of danger is greater in operations for microbic diseases. I will only refer to the pus microbes and the bacillus of tuberculosis. There is great danger that under the elastic bandage some of the microbic elements may be forced into the general circulation through the blood vessels or through the lymphatic system, and this means of hæmastasis becomes a direct cause of diffusion of disease. The other point which I wish to call your attention to is the harmful effect of linear constriction under an elastic tube. There is dauger of producing temporary muscular disability and often temporary or permanent paralysis. Elastic constriction, when applied in such a manner, acts upon a very narrow area of tissue, and is liable to produce dangerous compression, so much so that in many instances it is followed by temporary and occasionally permanent nerve paralysis. Linear crushing of a nerve by a narrow constriction is equivalent to nerve section in its immediate and remote results. I believe the same object can be obtained with the same degree of perfection and with much more safety by relying upon the force of gravitation in rendering the limb first comparatively bloodless, then resorting to elastic constriction by the use of Esmarch's constrictor, a broad elastic bandage. I place the arm of our subject now in a dependent position and you will notice how rapidly the veins fill. They become turgid because by the force of gravitation there has been produced a venous stasis. This picture undergo's a radical change in a few moments by simply placing the limb in an elevated position. The limb has now, in the course of one minute or even less, become almost bloodless. You doubtless remember the beautiful experiments made on the lower animals by Lister, who cut the posterior tibial artery of a horse, placing the animal in the dorso-recumbent position; he found that by this position alone arterial hemorrhage could be arrested.

I shall now apply elastic circular constriction, and will again insist, for the purpose of preventing injury to the deeper tissues, particularly the larger nerve trunks, that elastic constriction should be applied at a point where the nerves are well covered and protected by the overlying muscles. It has been my misfortune on two different occasions to witness in one case temporary—in the other permanent—paralysis by constricting the limb at the wrong point. For instance, in operating upon the upper extremity you should always, if possible and compatible with the site of operation, apply circular constriction at a point where the musculo-spiral nerve is well covered by muscles. It was in one of these cases that I applied the constrictor where the nerve is near the surface; immediately after the operation, I found complete paralysis of the nerve, which persisted in spite of energetic treatment for three or four months. In an operation on the lower extremity, where I applied elastic constriction just above the knee joint, I produced paralysis of the peroneal nerve which has remained permanent; consequently, as I have before remarked, elastic constriction should be applied at a point where the nerves are protected by the overlying muscles. In operations on the upper extremity, the constrictor should be applied over the insertion of the delloid muscles, and constriction of the lower extremity should be made above the middle of the thigh. I will now apply the constrictor by making first slow compression at a point away from the principal vessels of the limb, and you will notice that the veins are becoming turgid, and at a point opposite the location of the larger vessels I produce an intense venous congestion. The elastic constriction has been the means of producing this intense venous congestion. I believe now the circulation is entirely cut off. If I should operate on this limb I would encounter considerable unnecessary venous hemorrhage. I will, therefore, lay down as a rule that the elastic constrictor—the wide band—should be applied first at a point corresponding to the location of the principal blood vessels of the extremity, and that the elastic constriction should be made quickly, thus cutting off at once the circulation both in the arteries and veins. I will now do this. [Here Dr. Senn demonstrated experimentally his previous remarks]. If I make the constriction sudden, I do not produce the intense venous congestion that you witnessed a moment ago. We have, therefore, made two points clear; first the necessity of a wide surface of compression, and next of applying the elastic constrictor sudden and always first on the side occupied by the principal vessels.

It is still a question, gentlemen, to be decided by future research, how long a time it is safe to continue the elastic constriction. How long is it safe to deprive the tissues of blood supply? Experimental research has shown that an ischæmic condition and elastic constriction continued for two hours or more are liable to produce an unfavorable influence on the karyokinetic process in the tissues deprived of blood for this length of time.

I have made during the last year a series of experiments on the lower animals which I will detail below, and I found that, while operating on normal uninjured tissue, I was unable to produce gangrene on a large scale below the point of constriction in less than seventeen hours. Some beautiful demonstrations were given by Major Hoff during the last meeting of the National Association of Military Surgeons. I had the pleasure, at his request, to catechise one of the members of his corps in reference to elastic constriction as applied on the field of battle. I asked the young soldier how he would distinguish between arterial and venous hemorrhage. He pointed out very clearly the signs upon which he would depend in distinguishing between these two forms of hemorrhage. I asked: "How long would you deem it safe to continue elastic constriction as a hæmostatic measure?" He replied that he never allowed it to remain longer than two and a half hours. This matter may become—perhaps it has already—the subject of serious medico-legal thought, and no one is perhaps in a better position, where he has such abundant opportunities in testing the reliability and safety of elastic constriction as a means of controlling hemorrhage, than the railroad surgeon. It is, therefore, of the utmost importance to settle this matter both by clinical experience and experimental research.

I am greatly indebted to Dr. C. W. Oviatt of Oshkosh, Wis., for valuable assistance in conducting these experiments.

CONSTRICTION EXPERIMENTS.

First Series, February 14, 1892:

No. 1. Large female dog. Constriction above knee joint by three turns of strong elastic tubing. Time of constriction six hours. Cut the posterior tibial artery and vein before removal of constrictor. About a tablespoonful of dark blood escaped, soon followed by bright arterial blood. Circulation restored. Dog killed to secure bone-plate specimen from operation six weeks previous.

No. 2. Medium-sized male dog. Constriction above ankle joint. Time of constriction eight hours. Plantar artery cut before removal of constriction. About a teaspoonful of dark blood escaped. Arterial hemorrhage appeared a few minutes after removal of constrictor. Dog killed.

No. 3. Large female dog. Constriction by three turns of tubing above elbow joint. Time of constriction three hours. Limb perfectly cold below constriction. Pulsations distinct a few moments after removal, with prompt increase of temperature. Puncture yields arterial blood. Limb useless. Recovered the full use of limb Feb. 29.

No. 4. Large male dog. Constriction by three turns above wrist joint. Time of constriction seven hours. Pulsation distinct soon after removal. A deep groove in muscles at point of constriction. Was unable to use the limb at all for five days. Recovery complete in nine days.

No. 5. Male puppy. Constriction by two turns above knee joint. Time of constriction three hours, thirty-five minutes. Return of pulsations prompt after removal of constrictor. Puncture in sole of foot, followed by free hemorrhage. Recovered the use of limb in four days.

No. 6. Male poodle. Constriction above knee joint. Time of constriction two hours and twenty-five minutes. Return of circulation prompt after removal of constrictor. Recovered in three days.

No. 7. Large female dog. Constriction above elbow joint. Time of constriction four hours. Deep gutter in muscle at point of constriction after removal of constrictor. Pulsations felt distinctly almost immediately after removal of constrictor. Limb entirely useless for four days. Did not fully recover until twelve days.

No. 8. Female pug. Constriction by three turns above the knee. Time of constriction five hours. A deep groove at point of constriction. Pulsations distinctly felt soon after removal of constrictor. Fully recovered on the ninth day.

No. 9. Small male dog. Constriction above knee joint. Time of constriction four hours and thirty minutes. Prompt return of circulation after removal of constrictor. Limb entirely useless for two days. Entire recovery in six days.

No. 10. Small male dog. Constriction above the elbow joint by three turns of tubing. Time of constriction five hours and thirty minutes. Deep groove at point of constriction. Pulsations appeared almost immediately after removal of constrictor. Limb entirely useless for five days Complete recovery in ten days.

Second series, May 9, 1891:

No. 1. Large male dog. Constricted at 8:30 a. m. Constriction by means of stout rubber tubing two turns, just above the wrist. Removed at 9:30 p. m. Time of constriction thirteen hours. One and one-third grains of morph. sulph. were administered hypodermically in broken doses during this time. Puncture of palm before removal of constrictor yields venous blood. Deep gutter in tissue at point of constriction. Blood became arterial, pulse perceptible. May 10, limb still badly swollen and useless; May 12, begins to step on foot; May 14, recovery complete.

No. 2. Medium-sized female dog. Constricted at 8:35 a. m. Constriction applied by two turns above the wrist. Removed at 11:35 p. m. Time of constriction fifteen hours. Limb greatly swollen. Deep cut in palm before removal of constrictor yields only slight venous oozing. After removal, bleeding soon becomes arterial. Pulse perceptible. One and one-third grains of morph. sulph. injected in divided doses. May 10, limb greatly swollen and useless; May 12, limb still swollen and useless; May 14, swelling somewhat decreased; May 16, much better, uses the foot.

No. 3. Medium-sized dog. Constricted at 8:40 a. m. Constriction above elbow by three turns of tubing as tightly as could be drawn. Removed at 1:10 a. m., May 10. Time of constriction seventeen hours. Palm incised before removal of constrictor yields a little dark blood. In ten minutes blood becomes somewhat lighter in color but does not flow freely. In twenty minutes pulse could be detected, but was indistinct. Leg immensely swollen. Soft parts nearly divided subcutaneously at point of constriction. One and one-third grains of morph. sulph. injected in broken doses. May 11, limb swollen as much as ever; May 14, limb still swollen; entirely useless; begins to show discoloration; May 15, gangrene complete.

No. 4. Medium-sized male dog. Constricted at 8:45 a. m. Constrictor applied by two turns above the wrist. Removed at 3:45 a. m., May 10. Time of constriction nineteen hours. Limb greatly swollen, hard and cold. Deep cut in palm before removal of constrictor yields a very little venous blood. Deep gutter at point of constriction. Blood becomes lighter in five minutes, and in ten minutes pulse was perceptible. Circulation fully restored in twenty minutes. Three-fourths of a grain of morph. sulph. injected in three doses. May 12, foot still swollen, but uses it at times; May 15, uses the foot quite well, but limb is still swollen.

No. 5. Large male dog. Constricted at 8:50 a. m. Constrictor applied above the elbow by three turns as tightly as possible. Removed at 5:50 a. m., May 10. Time of constriction twenty-one hours. Limb enormously swollen. Deep cut in palm before removal of constrictor yields a little dark blood. In twenty minutes blood flowed a little more freely, and was somewhat lighter in color. In thirty minutes the pulse was indistinctly felt, and blood was arterial. One and one-half grains morph. sulph. were injected in broken doses. May 11, limb still swollen and useless; May 13, limb still greatly swollen and useless; May 14, swelling undiminished; May 16, swelling subsiding. Sensation is normal, but the limb is completely limp and useless.

No. 6. Medium-sized female dog. Constricted at 9 a. m. Constrictor applied by three turns above the wrist. Removed at 11 a. m., May 10. Time of constriction twenty-six hours. Limb greatly swollen. Deep gutter at point of constriction. Palm freely incised before removal of constrictor yields dark venous blood. In ten minutes blood becomes lighter in color and in twenty minutes pulse is distinct and bleeding arterial. One and one-half grains morph. sulph. in divided doses. May 12, foot still greatly swollen and entirely useless; May 14, begins to use the foot; May 16, very lame, but uses the limb.

In one of the cases in which elastic constriction was prolonged for seventeen hours gangrene resulted, consequently I deem it extremely dangerous to the integrity of the limb to prolong elastic constriction longer than two and a half or three hours. Even at that time we find that ischæmia acts unfavorably upon the karyokinetic processes of the tissus temporarily deprived of circulation.

Another disadvantage of elastic constriction as a means of controlling and arresting hemorrhage is the free parenchymatous oozing following its use. I have made it a strong point in operating with elastic constriction not to remove the constrictor until the limb is elevated and kept in an elevated position, making at once, as the elastic constrictor is being removed, a wide surface pressure by applying a compass of gauze, over which the flaps or margins of the wound are placed and manual compression made and continued for five minutes until the circulation has been restored. By so doing we prevent unnecessary loss of blood; by mechanically bringing into apposition the wounded surface with the inorganic aseptic substance we procure a local condition most favorable to expedite the definitive closure of the small arteries and capillary vessels. I therefore would lay it down as a rule, that in operating with elastic constriction, the constrictor should not be removed until the limb is put in an elevated position and surface pressure is applied. If parenchymatous oozing still continues you should resort to the next best means of controlling it, that is douching the wounded parts with water heated to at least 110 degrees Fahrenheit, so as to coagulate the primary products of the wound secretion and thus aid in arresting hemorrhage.

I do not wish to occupy any more of the time of the association, but for the purpose of bringing out a practical discussion on the few remarks I have made, I will read the following conclusions:

CONCLUSIONS.

1. The use of the elastic bandage to secure bloodless condition of limb should be discarded, as compression of the parts affected may produce mechanically dissemination of malignant tumors and microbic diseases.
2. Bloodless condition should be secured by elevation of limb prior to constriction.
3. Constriction should be made with sufficient force to interrupt at once both the arterial and venous circulation.
4. Prevent venous stasis by constricting quickly, beginning pressure on the side of the limb supplied with the principal blood vessels.
5. Linear or too firm constriction should be avoided, as they are liable to give rise to muscular injury and temporary or permanent paralysis.
6. Elastic constriction of limb for hæmostatic purposes should be diffused over an annular space not less than two inches in width and can be made with least danger of injuring important structures by a broad elastic constrictor made for this purpose or an elastic bandage.
7. Circular constriction of limb should be made, if possible, at a point where the large nerve trunks are well protected by overlying muscles, and if this cannot be done on account of site of operation, a thick compress of gauze should be interposed between the constrictor and the limb.
8. The vitality of tissues when excluded from the circulation is endangered by prolonging the ischæmic condition for three or four hours, and gangrene may take place if constriction is continued for a longer time.
9. The process of karyokinesis in tissues deprived of circulation by

elastic constriction is unfavorably affected if constriction is continued for more than two hours.

DISCUSSION.

Condition of limb five weeks and two days after constriction: limb entirely useless, drags foot upon the ground without the least ability to raise it, somewhat larger than opposite limb, circulation feeble but distinct, dog killed; post mortem appearance, tissues pale œdematius. The radical artery and medlan nerve show marked changes at point of constriction.

Dr. E. S. Lanphear, Kansas City, Mo.—I would like to ask Professor Senn a question that is of great importance to the majority of those present. It is the practice upon roads having a hospital system to require the local surgeon to supply some means of controlling hemorrhage temporarily. and then to bring the patient to the hospital. In many instances this requires at least six or seven hours. How then, without operation at the place where the injury occurs, can the local surgeon control the hemorrhage until the patient is in the hospital and ready for operation by the hospital surgeon?

Dr. Senn—That is a point I wish to speak about. How long is it safe to continue elastic constriction? We have found as a result of our experiments, even in intact tissues, that circular compression, continued for seventeen hours, was followed by gangrene. In another instance, in which it was continued for twenty-six hours, no gangrene resulted. In all of the experiments, where it was allowed to continue for two hours or more, there was muscular disability. I should say that if the time intervening between the receipt of the injury and the primary dressing and the operation to be done at the hospital is more than three or four hours, I would deem elastic constriction of the limb injured unsafe, because the liability of gangrene is greatly increased in injured tissues. If it can produce gangrene in a healthy limb by being continued for seventeen hours, it is reasonably certain that if elastic constriction is prolonged for more than three or four hours in the case of an injured limb, we run the risk of producing gangrene. We should in these cases resort to direct hæmostatic measures, the use of the compress in case of venous hemorrhage, of applying forceps to the artery, then apply a temporary dressing, and not rely upon circular constriction if such a long time is required to bring the patient from the place of injury to the hospital for operation.

Dr. George J. Northrop of Marquette, Mich., cited a case in which a local surgeon applied a rubber bandage, and for at least nine or ten hours continuous pressure was kept up. There was no gangrene or disturbance of the vitality of the tissues as the result of it.

Dr. W. H. Elliott, Savannah, Ga.—One point occurs to me in connection with the subject we are discussing. We often lose sight of an important point in the application of the rubber bandage to arrest hemorrhage, and that is the time between the injury and the time we can get the patient to the place where he is to be operated on. It depends a great deal on how tight the surgeon puts on the rubber bandage. In order to arrest a great many cases of hemorrhage you do not need to put on the rubber bandage very forcibly to render the limb bloodless, but only enough to stop the hemorrhage. In that case the slacker you put on the bandage the less danger there is, either temporary or permanent. You can judge how tight to apply the bandage by an examination of the case.

Dr. Solon Marks, Milwaukee, Wis.—I agree with Dr. Senn except in one thing: I think the gauze should be applied in all cases before applying the constrictor. The gauze can not do harm and it may do good. I have used the constrictor a good deal, and I have produced temporary, but never permanent, paralysis with it. I repeat that we should in all cases apply the gauze before applying the constrictor, no matter where it is.

Dr. S. S. Thorn of Toledo, Ohio, said the time specified by Dr. Senn was sufficient in almost any emergency, and that surgeons might with entire safety remove the rubber bandage and send patients over the road after one hour.

Dr. J. B. Murdoch, Pittsburgh, Pa.—Mr. President, I think we all owe a debt of gratitude to Dr. Senn for coming here and talking to us upon this important subject. I had the pleasure of writing a paper for this association upon the danger of the tourniquet, its uses and abuses, and when I speak of the tourniquet, I refer to the rubber cord and rubber bandage as a tourniquet and as being the source of more danger than any instrument we are in the habit of using. I honestly and sincerely believe that, notwithstanding its great advantages as invented for 'the arrest of hemorrhage by constriction, more limbs have been lost by the use of it than have ever been saved, and it has destroyed more lives than it has ever saved. The rules for its use must be clearly understood, and it is such experiments as have been made by Dr. Senn to show how long constriction may be had with safety that will enable us to tell how to use it and not to abuse it. Every man connected with a general hospital where wounded men are coming in from a distance has seen them come in with a slight cut of the leg—a cut where the patient would not have lost perhaps two teaspoonfuls of blood, yet with the tourniquet on, and sometimes with an elastic bandage, and the limb almost in a state of gangrene. The tourniquet was applied as a measure of safety, as they call it.

Our policemen are taught how to arrest hemorrhage, our locomotive engineers and conductors are taught to do likewise. The man who knows how to arrest hemorrhage is a great surgeon. You can teach a policeman in a few hours how to do it. In order to arrest hemorrhage, it is sometimes necessary to take up the largest arteries in the body. You can not teach the laity how to do that. You can not teach any man how to act in an emergency without giving him a thorough education. It is in an emergency that the greatest education is required. It required a lifetime to teach the Duke of Wellington how to act at the battle of Waterloo. He was educated for that emergency. The idea of teaching the laity how to arrest hemorrhage, has resulted in a great deal of injury. It is stated in one of our books of instruction how to stop bleeding. If the blood is a bright red and comes out in spurts, that is an artery; if it is dark and comes out continuously, that is a vein. If the hemorrhage is from an artery, put the tourniquet above the wound; if it is a vein, put it below the wound. Any man who has had a large experience in the treatment of wounds knows that the distinction between an artery and a vein is not so clear; therefore distinguished surgeons have been at a loss to know where the hemorrhage was coming from. The compression should be made in the direction of the hemorrhage, not applied above or below the wound, but upon the wound. The best service the layman can do for a wounded man is to put his finger upon the wound and tell somebody to run for the doctor. He should hold his finger on the wound, and if he can not send for the doctor, he should stay there until somebody comes along.

With regard to the cord and bandage, which Dr. Senn has so beautifully illustrated to us, it has been my practice for the last twenty years to use nothing but the Esmarch bandage, and no constriction above it.

Dr. C. B. Stemen, Fort Wayne, Ind.—The question I wish to ask is, how long in uninjured tissue would it be safe to allow constriction to remain?

Dr. Senn—There was one point brought out in the discussion which, I believe, needs a few remarks in addition to what I have previously said, viz., the danger attending imperfect constriction of the limb. If you resort to elastic constriction as a hæmostatic measure, the safest plan to pursue for the patient and for the tissues is to interrupt the circulation, both arterial and venous, at once, and keep it interrupted. By applying constriction with sufficient firmness to diminish arterial hemorrhage, you certainly will increase the venous oozing. It is by overloading the tissues with venous blood that you invite gangrene and increase of the hemorrhage.

I believe Dr. Murdoch has underrated the value of elastic constriction in the hands of the layman. It was the consensus of opinion of the military section of the last International Medical Congress in Berlin that it is no longer wise nor practical to differentiate between arterial and venous hemorrhage on the battlefield, or in a case of accidental hemorrhage; that the one point that must be taught the soldier, the brakeman, the conductor, if hemorrhage is so profuse as to threaten life before medical aid can be summoned, is to arrest it at once by elastic constriction—by a suspender if nothing else is at hand—by applying constriction invariably on the proximal side of the seat of injury. By so doing you prevent death from hemorrhage, you gain time to summon the necessary medical aid, and you will have saved not only limbs, but valuable lives. [Applause.]

A Suggestion in the Healing Following the Contused and Lacerated Wound.

[W. B. Outten, M. D., Chief Surgeon Missouri Pacific Railway, St. Louis, Mo.]

The period has long since passed when it was necessary to either defend the germ theory of putrefaction or the theory of antisepsis in relation to surgery, as continued investigation in laboratory and the clinical field accumulate evidence constantly and unceasingly convincing. It is a waste of time and argument to try to defend when years of brilliant result mark the rapid and wonderful course of the theory of antisepsis in the field of operative surgery. It is impossible to compute the saving of time, suffering and lives brought about by the application of the theory of antisepsis in the treatment of wounds—effective, broadly utilitarian, establishing confidence and giving scope of action to the surgeon wonderful in its varied application. To the surgeon who has worked in the operative field of the past and is now working in the present it scarcely seems to be the same realm of labor, and a retrospection never fails to bring enthusiasm, admiration and thankfulness in being permitted to witness the increased efficiency and scope of operative procedure. The application of antisepsis in treatment of the incised wound made either within the operative field or out of it has reached almost perfect result. The prevention of the entrance of living pathogenic microbe, the preservation of the vitality of the tissues, absolute hæmostasis, and a study of detail and drainage have obtained uniformity of result which certainly vindicates the utility and variety of the theory of antisepsis.

Having thus attained in the treatment of the incised wounds a perfection of result in proportion to the care and detail used in making wounded surfaces aseptic and keeping them so by the various means at command—the accomplishment, through asepticism, of healing by first intention—the field of operative surgery became so immensely broadened as to almost change the duties of its followers. The extension of specialties has so divided surgical labor that many prominent surgeons only deal with the incised wound as operatively made by themselves, rarely coming in contact with the trauma of accident. As a consequence of healing by first intention (through asepticism) special operative surgery has been and is now of enormous growth, and the healing of wounds by first intention is receiving constant and unremitting attention. Accidental surgery or the surgery of violence, which is largely of that class of trauma in which healing by first intention is the exception and not the rule, hence the trauma of the surgery of violence, seems to have been relegated to a position in which the best element of thought and work are not manifest. The treatment of the granulating wound, notwithstanding the difficulty depending upon its cure, is subject to continuous faulty detail and routine in the application of antiseptics. Accidental surgery, or the surgery of violence, being not alone important in consequence of numbers and sequelæ which frequently remain, the field is certainly important and broad enough to receive the closest and best element of thought and labor.

During the past ten years the writer has tabulated 15,321 railway accidents, or rather injuries, and finds that it is pre-eminently the contused and lacerated wound which predominates. Thus out of the number given above there are 3,421 contused wounds; 2,647 lacerated wounds; 2,945 specified as crushing, which are essentially contused and lacerated wounds combined; so that out of 15,321 railway injuries, 9,013 were of the contused and lacerated variety. This being the fact a great number of them heal by second intention or granulation; the wounds following the contused, the lacerated, and the contused and lacerated combined are subject to healing by granulation. These classes of wounds present many reverse elements in their management; the loss of tissue and slowness of repair make them not only important numerically and permanency, but their tendency in many instances to give constitutional disturbances owing to a loss of substance and tissue-producing elements.

The extent of destruction in contused and lacerated wounds, and the tissues involved, of course, constitute elements of difficulty in healing; being repaired by proliferating fixed tissue cells, the character of the structure involved and the amount of material required are in many instances the essential element to interpret. Where we have extensive loss of substance of course aid and assistance is required in replacing this loss of substance as much as possible, and in this class of cases skin grafting as indulged in by Thiersch when properly applied certainly meets the indication extremely well. Where we can approximate granulations and obtain healing by secondary adhesion of granulations, or by removing condensed or chronically inflamed tissue to be replaced by a bed of plastic lymph, this is eminently fit and proper when the indications present themselves. But we maintain that many granulating surfaces need not be subject to the Volkmann spoon, and if properly treated good results may be attained even without the application of the sutures to bring about adhesion of granulations, which in many instances is almost impossible. The embryomal cells of granulating wounds under favorable circumstances become transformed into new tissue of extreme delicacy, possessing a vascular supply which is not always uniform, and being less resistant in proportion to this lacking supply we have these cells subject to the destructive action of the pus microbe, their ptomaines and physical causes.

Senn says: "As long as suppuration remains active the superficial layer of granulation cells are destroyed, and as soon as other embryomal cells take their place the process is repeated, and thus the healing of the wound is indefinitely delayed. When a favorable change takes place in the wound either spontaneously or from the employment of antiseptic measures suppuration is diminished, the granulations become firmer and more vascular, and cicatrization and epidermization now progress in a satisfactory manner."

Now it certainly appears that in treating the granulating surface unless the first dressing is antiseptic or aseptic substance, which accomplishes much of the healing effort, each repetition of dressing made too frequently impedes the healing process. Of course the condition of the patient cuts an essential figure. There can be no doubt when the various kinds of antiseptic gauzes are applied directly upon the granulation surface that upon each removal we have cellular destruction and injury to a certain extent of already existing granulation. We cannot refrain from thinking that with tissues so delicate as granulating tissues when the roughened surface of gauze is frequently packed and pressed upon the granulating surface and then removed the granulations are torn and much of the benefit obtained by their aseptic condition is lost. Again, their impregnation with antiseptic solution too strongly made certainly tends to destroy cellular elements which are replenished while the dressing remains aseptic.

If then the essential motive of antiseptic and aseptic wound treatment is to prevent the entrance of living pathogenic microbe into the wound and at the same time to preserve the vitality of the tissues themselves, do we meet the indication by the application of various aseptic and antiseptic gauzes as at present applied? After years of faithful trial I have failed to obtain results which were satisfactory in a majority of the cases and cannot refrain from thinking that gauze is not the proper application to use. Realizing the immense benefit obtained by capillary drainage through the agency of the gauze I yet conceive that other elements more than neutralize this, and that if we could find some protecting substance capable of being rendered aseptic and at the same time so light and filmy that exuded fluids might find vent and not be damaged by pressure through accumulation, the perfect rest demanded might be accorded to the delicate healing granulating surface. I maintain that in many instances the continued application of iodoform and corrosive gauze applied to the granulating wound is not much in advance of the old treatment by unguents, etc. I have used the various forms of antiseptic and aseptic gauzes, various aseptic powders, such as iodoform, dermatol, aristol, sterilized substances, such as gauzes, Baltimore earth, salicylated powders, which seemed to act in many instances as irritant and foreign substances and mechanically interfere with the healing process.

To my conception cyanide of mercury gauze as advised by Lister is immensely superior to the bichloride or to the aseptic rubber tissue or oil silk; but I do not believe that the cyanide of mercury gauze can be depended upon unless made directly under the surgeon's supervision, and in fact no gauze should be trusted unless a complete history has been obtained as regards its treatment. Detail in the application of the cyanide of mercury gauze is excellent. Thus after the gauze has been properly made by placing it in the solution of bichloride of mercury, 1 to 4,000, its employment is described as follows: "Immediately over the wound we place a portion of the cyanide gauze, washed in a solution of carbolic acid to get rid of the bichloride of mercury in the dressing, in contact with the wound. For this purpose one part of carbolic acid in twenty of water is safer than any weaker solution. A very pure acid should be used, because if impure it is not completely dissolved, and the undissolved particles are needlessly irritating to the surgeon's hands. When a dressing is changed place this piece of gauze over the wound before the surrounding parts are cleaned with carbolic solution. The carbolic acid soon flies off from the washed gauze, leaving nothing in contact with the wound but the unirritating cyanide."

As I have previously said I do not believe that any gauze when continuously applied meets the indication for the best treatment of granulating surface. Aseptic wound treatment is the treatment of rest, and gauze does not continuously give the rest required. If some substance could be rendered aseptic simply affording perfect protection to the granulations, then it would be all that was required in the shape of a dressing, and good results would follow in the treatment of granulating surfaces. Goldbeaters' skin seems to present many of these elements; it is light, velvety and filmy, and is an animal tissue, can be rendered perfectly aseptic and seems to stand extremely well harsh treatment in being rendered so; it will stand boiling for some time without showing much tendency toward a change of its substance, certainly long enough to render it aseptic.

My first trial was made by saturating the skin with glycerine and then boiling it for a short time, when it was taken from the boiling water and placed in alcohol. When we desired to apply it to the surface of a wound it was taken from the alcohol and again put in hot water for the purpose of removing any excess of alcohol and then applied to the granulating surface. Upon redressing the wound on the fourth day the skin was found to have been absorbed. This wound was on a negro, and the granulations seemed to present a different appearance; instead of having the red vascular look they were covered with a somewhat heavy pellical of connective tissue, which by the application of the blade of a knife could be scraped off, showing the healthy granulations underneath and seeming to only lack the repressing influence of epidermic cells. Thinking that this might be due to the influence of the alcohol in the goldbeaters' skin various other methods were used. One batch of skin was treated by putting it into a mixture of one drachm of chloral, one drachm of carbolic acid, one drachm of camphor to four ounces of glycerine and water, the water of course being in its boiling state. With this I did not notice any difference from the alcohol treated skin. Again the skin was saturated with the cyanide of mercury solution and treated essentially the same way as the cyanide of mercury gauze. Up to this date I have not been able to render the skin sufficiently non-absorbable.

The same condition exists as regards the granulation I spoke of in which the alcohol treated skin had been applied. I find in every instance that where the skin has been applied it cannot withstand the pressure of the granulation longer than the third day; that under some circumstances it has been absorbed, particularly on a recent granulating surface, within twenty-four hours. That the goldbeaters' skin, when rendered aseptic and applied to the granulating wound with a protection of oiled silk or rubber tissue previously sterilized by steeping in hot water and the bichloride gauze covering the whole, minimizes the flow of pus can be demonstrated. Upon their removal, while the goldbeaters' skin has been absorbed, granulations are not torn and wounded, necessitating additional repair. That this soft tissue is less likely to injure delicate granulations than gauze is demonstrable, and from recent experience I am convinced that much time is saved in the healing process by its application. In old granulating wounds surrounded by chronic and indurated tissue which when removed by the Volkmann spoon shows a bed of plastic lymph it certainly seems that the application of aseptic goldbeaters' skin aids the healing process in a remarkable manner. Admitting that the stimulating effects of the spoon ordinarily makes it heal more rapidly, still after the application of the skin upon this bed of plastic lymph cellular proliferation seems to proceed with unusual rapidity, as evinced by a decrease of exuded materials and the rapid repressure of granulations, evidently stimulating the epidermic cells to unusual activity.

I have found the application of this skin especially active upon the granulating wound of the negro; indeed the difference I have marked on more than one occasion. The goldbeaters' skin being made from the ilium of the ox evidently its peritoneal layer presents a soft silken surface which cannot possibly injure the equally delicate granulation. It was selected for this reason, that it was as near a perfect protection as could be devised. That the cells which enter its composition have anything to do with the healing process the writer doubts, but he believes that it is mainly the protection rendered to the embryomal cells in their development and connective tissues which constitutes its virtue. The difficulty presented in this element is its ready absorbability. The influence of chromic acid upon this skin has not yet been sufficiently demonstrated, but that the skin can be rendered perfectly aseptic by essentially the same processes which are used upon the gauze has been demonstrated.

Finally my experience is not sufficiently extended so as to enable me to speak absolutely authoritatively, but I am convinced that the results thus far accomplished are worthy of continuous and extended trial. The effort is in the right direction, and, as previously stated, judging from experience in the past the present method of treating granulating surfaces by using the various forms of gauze, oiled silk, rubber tissue certainly has not advanced the treatment of the granulating wound much beyond what it was in the days of poultices and ointments, as any one who has had extended experience in the treatment of this class of troubles can verify. Skin grafting as devised by Thiersch is certainly not only an excellent device but one which will be constantly commended by all who try it as recommended by Thiersch, but the cases in which this can be applied, or rather should be applied, are not great in number. The ordinary granulating wound so frequently met with is the one which demands the surgeon's attention almost continuously.

The Value of Blood Clot for Dead Spaces.

[By Samuel C. Benedict, M. D., Athens, Ga.]

The subject which I wish to bring before you, gentlemen, as surgeons, and more particularly as railway surgeons, is one which has interested me more or less ever since it has been my office to treat accidental wounds, as well as that class not acute trauma—the strictly operative work. The subject is that of the healing of wounds under the moist blood clot as advocated by Schede in 1886, or as I have titled this discussion, "The Value of Blood Clot for Dead Spaces."

I am aware that I am about to bring to your minds that part of our surgical work which has been but little discussed in the treatment of wounds and which, although as a method almost entirely new, is constantly being presented to us as a practical question, and in whose favor our daily experiences are constantly adding new converts. So uniformly satisfactory have been our results under the teachings of Lister where drainage is used that at this day one would seem to be overstepping the bounds of safe surgery to advocate the certain aseptic healing of wounds without the use of drainage tubes. In an experience of ten years past in railroad and operative surgery I have used in but very few instances this means for keeping a wound in the proper condition for primary union, and although in this treatment I have not until recently been supported by authority, still by the strictest attention to surgical cleanliness I have cause to be satisfied with my results, results so gratifying as to aseptic repair as to have made me an enthusiast in antiseptic surgery without intra wound drainage. That there are many of you before me who are of the same way of thinking I do not doubt, for why should I alone, doing the same kind of work as yourselves under the same conditions, be an exception?

With this belief in my mind, the belief that in strictly aseptic wounds we need no intra wound drainage, I welcomed with delight and gratification a recent article upon this subject by Dr. William S. Halstead of Johns Hopkins hospital, Hospital Reports for 1891, Vol. 11, No. 5. His discussion, so ably and interestingly made, is a pioneer in this country, for systematic work of this kind, and as one of the pioneers in presenting such a subject to intelligent surgeons I ask your indulgence for a few minutes only in order that I may present this subject to you for thought and practical application in the future, if so your wishes incline, or at least for a short discussion before this body involving the pros and cons, as your own convictions or experiences may suggest. That I am a convert to the abolition of the drainage tube in antiseptic surgery I do not affirm, but that this means for promoting success in our surgical technique is oftentimes not only useless but injurious to rapid repair, I am of the opinion.

Previous to the time of Schede's advocacy of the healing of all operative wounds under the moist blood clot but little attention had been directed to this mode of wound treatment; the teachings of Lister, that all wounds of any size must have their dead spaces obliterated by close suture approximation and external pressure, and that in order that they should be kept so drainage must be used, have been so prolific of good and uniform results that few have ventured to leave wounds undrained. Since Schede's method and results have been given to the world, a few surgeons have made attempts to get equally aseptic results and of course without drainage. Notable among these experimenters is Dr. W. S. Halstead, as before mentioned, who in his reports from Johns Hopkins hospital cites many cases of perfect union under the moist blood clot, having had suppuration in but two cases, no deaths, and in no case was artificial drainage used. Dr. Gerster, in his admirable work on aseptic and antiseptic surgery, p. 12, gives the method of Schede, and on p. 200 that of Neuber for the obliteration of dead spaces, prefacing the method of latter (Neuber) by the remarks that "in cases where the surgeon is reasonably sure of having produced an aseptic wound either Neuber's method of implantation of skin flaps, or *what is better* (italics mine) Schede's method can be employed," and on p. 203 is this statement, "Schede's plan has the great advantage over Neuber's method that it can be employed successfully under the most varying conditions. Its simplicity and independence of the presence or absence of skin covering commend it to the attention of the surgeon." He then gives the result in a case of extensive removal of bone from the upper portion of the tibia, where all granulations were scraped away, the wound in the bone allowed to fill by blood from the capillaries, the skin closed over the bone and not into it as by Neuber's method. Four weeks afterward the first change of dressings was made, when it was found that everything had healed, the clot having been completely organized. The younger Gross was an advocate in certain wounds of the use of the blood clot for dead spaces and in his lectures dwelt at length upon the organization of such a clot into the respective tissues which it separated, but as far as I know no one had previous to Dr. Halstead made a systematic attempt to treat all wounds by the use of the blood clot, doing away entirely with any artificial means of drainage within the wound.

To those of you who have not read his account of these successful experiments I would suggest that you will find a great deal of interesting and valuable reading in his report above referred to. His results have been so uniformly the same as to aseptic repair and his confidence in the feasibility of this procedure so assured, that I believe his methods and suggestions will be read with deep interest by any advocate of aseptic surgery. It has not infrequently been my fortune to observe the perfect repair of large wounds without drainage tubes and where I was satisfied there was no approximation of divided tissues other than perhaps of the skin and where the dead spaces were unquestionably filled with blood clot, and I believe that by every one of you to a greater or less degree the same results have been observed. In some cases this has been the condition when, by care in ligation and approximation by sutures, there was a reasonable assurance that all bleeding had been stopped and dead spaces obliterated, but can we conceive of any wound which has no dead spaces, be they ever so small? When we use drainage can we ever say that this drains every part of the wound? There must be with all this care some places filled by blood clot; and this clot is either absorbed in toto, or into it the organization process advances. Now to my mind the results of Dr. Halstead prove that this blood clot with which he fills dead spaces is under his strictly aseptic technique a far better, surer and more natural method of repair than that of close approximation of divided tissues by sutures and external pressure for as he says the danger of strangulation of the living tissues by the tension of sutures is one of the greatest objections to the drainage plan. After mentioning the different plans of Kocher, Neuber, and Kuster for dispensing with drainage tubes he adds:

"Impressed by the work of Kuster, Neuber and others, and entertaining with them the same fear of blood in wounds, it was my practice for several years to attempt with the utmost care to obliterate the dead spaces in wounds. The results were gratifying, but the technique was often very tedious. For example, after an amputation of the thigh it would not infrequently take an hour to obliterate thoroughly all the dead spaces. The mechanical problems were often quite difficult, and one was perpetually annoyed by the fear that he might strangulate the tissues included in the sutures. After a time I became convinced that it was impossible to obliterate thoroughly all the dead spaces in some wounds, and I observed that the wounds in which the dead spaces were not obliterated healed thoroughly by first intention just as regularly as did the other wounds. I was therefore quite prepared to welcome Schede's article on the healing of wounds under the moist blood scab. This contribution of Schede's I believe to be the greatest which has been made to the technique of surgery since the introduction of the antiseptic methods of Lister."

He then gives a summary of all wounds treated without drainage and without dead space obliteration from the opening of the hospital, May, 1889, to June, 1890, making 122 cases. Among the classified are:

Tuberculous bones and joints	10
Operations for carcinoma of breast	13
Radical cure of inguinal hernia	8
Thigh amputations	2
Operations for ununited fracture	2
Extirpation of inguinal glands	6
Necrotomies and bone abscesses	11
Removal of cysts and new growths	14
and others.	

In all of these operations where blood clot was used for the obliteration of dead spaces there was primary union in all but two cases and no deaths. Such results I do not believe are often obtained by even the strictest attention to antiseptic details, including drainage, and cannot but impress the aseptic surgeon that possibly and probably, in the use of drainage tubes, we are in very many cases doing more than is necessary. True, the drainage tube is of imperative necessity where there is not an aseptic wound, and because these operations were made under surroundings peculiarly favorable in the highest degree to asepsis, we would naturally and properly question the possibility of obtaining such results under the surroundings of filth and "ground in" dirt as railway surgeons are often compelled to operate. But do we, because of the fact that such brilliant results are obtained in strictly operative surgery under antisepsis and drainage, refuse to endeavor to apply the same principles when we meet with our worst cases of railway injuries? Are there not many cases where we are able to obtain an aseptic condition in our wounds, and do get primary union even under these unfavorable conditions?

For ten years I have been employed in railway surgery, and what I have learned in antiseptic technique has been entirely from the literature upon the subject and my own experience prefaced by many failures. Gerster and Wyeth have been my text books, and as I look back upon the difficult accidental surgery of the years gone by in which I have obtained such results as to make me an enthusiast in the principles of aseptic work, I can recall many wounds in which I have obtained primary union with no sutures other than those of the skin, and with no attempt to obliterate dead spaces by suture or drainage within the wound. The blood clot has been the means of obliteration, and into this clot has proceeded the repair of the separate tissues, using as I believe, the clot as a pabulum for the outreaching capillaries from the different injured tissues—the clot not in itself being developed into the tissues. Whatever that process may however be, we know that in many cases in our experiences wounds have healed primarily where we have used no deep sutures and no drainage, and where the dead spaces were filled with clotted blood. That a portion of this clot is absorbed there can be no question; whether it contain red corpuscles or not is immaterial, it is the fibria of the clot into which the capillaries develop as into a sponge, but unlike the sponge these vessels and the cells obtain material from the albuminous fibria for further development and growth, or as the common term is, the clot becomes organized.

In 1884 I had occasion to test the value of antiseptic non-drainage work upon a negro boy of 12 years who had received a severe injury by having his right arm caught in a brick machine. The right humerus was obliquely fractured just below the neck and the distal end pushed up through the deltoid, making a long ragged tear. The head of the bone was left, but partly dislocated, and the apparent injury so great that I was advised to amputate. I however removed the head of the humerus, rounded off the end of the distal portion, closed the wound while oozing was going on and dressed antiseptically, using no drainage. There was in two weeks primary union, and to-day the boy, with nothing but a flail joint, is employed in a livery stable driving horses. Two or three years ago a brakeman on the R. & D. fell in front of a backward moving train, nine cars, engine and tender passing over him. Besides extensive scalp wounds and lacerations of face, hands, shoulders and buttocks, the right foot on its outer surface, together with the heel, had been crushed. The whole tarsal and metatarsal regions were exposed and amputation seemed imperative. After removing the much lacerated portions of bone and soft parts, and washing out the wound thoroughly, I closed, without drainage, getting primary union, and to-day, as brakeman, he goes about with scarcely a halt.

Only a few weeks since a trestle hand, by the point of an adze, had the carpal end of the right radius cut off, the radial artery severed, with division of flexor radialis tendons, and the wrist joint opened. The wound had been packed with waste to stop hemorrhage but no compress or ligature placed above wound. The man was almost exsanguinated when I reached him, in a poorly lighted cab, about 9 p. m. An aseptic condition seemed nigh to impossible, but the attempt proved successful, with no sutures but three in the skin and blood clot in the wound. There never was any suppuration, and he is to-day at work, having almost complete use of fingers and some motion in wrist joint. The number of such cases could be increased even in my own very limited experience, for how very many are there of you, gentlemen, who have had more years of experience and much greater opportunities than I, and who could undoubtedly each report similar cases with similar results, without the use of drainage tubes or deep sutures; simply surgical cleanliness and the filling of the dead spaces with a blood clot which had become organized. Therefore I say that the method of Dr. Halstead, as systematically carried out after the suggestions and usages of such men as Schede, Neuber, Gerster and others, is worthy of attentive consideration.

The details are very simple when we have a reasonable certainty of an aseptic condition of the wound. Take for example one of those crushing wounds of a limb where bones are comminuted, soft parts much contused, tendons divided, and yet where there is a reasonable hope that the distal circulation will remain sufficient. As with all wounds the first thing to do is to remove foreign material as thoroughly and carefully as good eyesight and antiseptic solutions can; then all portions of tissues which cannot probably live and so act as foreign material and pabulum for suppurative processes; then as much as possible to bring together by sutures such parts as tendons, nerves and bone, leaving alone the suturing of muscle tissue. After all but capillary oozing is stopped, and the dead spaces and exposed tissues thoroughly washed out with an aseptic solution, the wound is to be closed by skin and buried skin sutures as nearly as possible, no drainage within the wound being used. After this strips of aseptic rubber tissue are laid over the lines of approximation or attempted approximation, and the spaces unclosed but filled with blood clot also covered, then iodoform and sublimate gauzes, cotton and bandages in the usual way. Of course the proper immobility of the part must be assured. The buried skin suture is a special feature of the technique in the work of Kuster and Halstead, the finest black sewing silk being used. These sutures are taken from under the skin, passing out through the upper cells of the derma and below the epidermis, and when the edges are approximated do not show. It is not necessary to remove them, as in from three to eight weeks they appear on the surface as little loops and may be brushed off.

If in our work as railway surgeons we could free our wounds from those sources of septic infection to which the large majority are inevitably subjected, and could remove positively all tissues which are, as to future circulation through them, dead, then we might be the more ready to adopt systematically the plan of treating all wounds by the blood clot, and without drainage, possibly without germicidal solutions, for it is claimed by many that there is a superficial necrosis produced upon living tissues by such solutions, but so many wounds so treated do heal primarily that we would be slow in our railroad work to do away with this additional means of securing asepsis. Wounds however, treated without drainage, deep, large wounds even, do so often heal by first intention, and so much more thought is being given to this subject within the past year than formerly, that I believe the day is not far distant when we will find that we have so sufficiently mastered the technique of blood clot vs. drainage as to be able in most cases of railway injuries to dispense with all means of wound drainage by tubes or even by catgut.

Syphilis—Its Relation to Railway Employes and Passengers—With Cases.

[By Dr. Hugh F. Nelson, Charlottesville, Va.]

Since first the landed portion of the earth's surface began to be intersected by railroads, casualty of one sort or another has befallen a certain percentage of persons engaged in manipulating rolling stock, as well as of those transported, to say nothing of those injured by moving trains who are neither employes nor passengers—in the main, trespassers upon the property of the railway companies.

Railway injuries may be naturally divided into classes—slight, severe, fatal; and again the slight and severe may be subdivided into temporary and permanent. Thus a person may have a distal phalanx of a finger so injured as to necessitate its removal, and the injury though slight is necessarily permanent. On the other hand, many persons under proper treatment recover from contusions which at the time of injury one would think must prove fatal, and yet no mark remains to indicate even the seat of injury.

Again, persons are subjects of railway injury apparently so slight at time of reception as scarcely to attract even their own attention, who are subsequently either totally disabled or die, said disability beginning or death occurring at time more or less remote from date of injury.

Finally in this connection, after every railway accident of any magnitude there are to be found those claiming to have been injured, in whom the closest scrutiny of the competent surgeon fails to find any objective condition to account for (frequently) a long list of subjective symptoms.

As railroad companies have increased in number and as individual companies have extended their mileage there has swept over the country the idea that these corporations are reservoirs of ill-gotten gain, and that every cent wrung from their coffers is but the rightful possession of any who secures it.

There will be for all time, as there has been in the past, litigation between persons injured or the representatives of persons killed in railway accidents of the one part, and railway companies of the other part; and the companies are often mulcted heavily, when at periods more or less remote from time of accidents persons injured in greater or less degree either show up as cripples or die.

If subjects of railway injury progressively decline from time of reception of such injury, or from a time subsequent to such injury, to be measured by hours or a few days at most, till either permanent disability or death ensue, the injured or the representatives of the dead should receive recompense provided contributory negligence on the part of the company be established.

The question of how far railway companies should be held responsible for the subsequent permanent disability or death of persons injured, apparently partially or totally recovering from the immediate effects of such injuries, is one that in justice to all concerned demands more careful investigation than has as yet been accorded before the true solution of the problem can be reached.

This with regard to both slight and severe injury, not including, of course, loss of limb or special sense. More especially, however, does this question maintain in that not very small number of cases in which permanent disability or death remotely follows in case of employe or passenger claiming injury in an accident when objective conditions are not discovered by careful and able surgical attendants at time of accident.

The citation of a few recorded cases as observed in service as surgeon for the C. & O. railway company at Charlottesville, Va., during the past eleven years will furnish some facts bearing upon the question in hand.

Case 1—N. P. B., aged 36, married, brakeman on passenger train C. & O. railway, on April 28, 1890, sustained very slight injury under the following circumstances: The train on which B. was employed as brakeman was coming into a station and the air brakes worked badly so that control was lost over the train. A sharp curve prevailed immediately in front of the station, the sheds of which were in such close proximity to the track that the coach on which the brakeman was—the speed of train being greater than ordinary at the point—came in contact with and tore away portions of the shed and itself overturned. This coach was a sleeper.

When B. came under my observation this record was made—Letter book, p. 222—"Slight contusion of head and face and muscular strain of shoulders." The bruises were so very slight that I hardly thought anything was necessary, though I gave him bromide of potassium and directed cold to the head. The scratches on the face and forehead healed in less than ten days and were accompanied by no discoloration of surrounding skin indicative of severe contusion. I only saw this case on this day and four times in the month of May. After my first visit he complained of pain in the lumbar spinal region more than elsewhere, and here there was absolutely no mark of injury. I tried blistering and cupping, but though he was going about nothing seemed to do him any good. Knowing that the patient was syphilitic, I put him on mixed treatment in full doses and heard no more of him till instructions from the chief surgeon required the following statement under date of June 9, 1890:

"I went to see brakeman B. yesterday and can find nothing wrong about him save that he still complains of pain in lumbar spinal region. There are absolutely no objective indications and no apparent results of the subjective symptoms (the only ones to be gotten hold of). * * * * We would suggest that you summon B. to R. and make personal examination of his case." —Letter book, p. 228.

B. put himself under care of a physician three miles out of town, to whom he had to go for treatment and entered "suit for damages" against the company. I used to see him almost daily on the streets walking with a cane, and subsequently he got employment as a bartender, where he had to be on his feet for many hours every day. He was never a drinking man.

B. vs. C. & O. Ry. Co. came up for trial on Nov. 19, 1890, and I attended as a witness. The trial of the case, however, was postponed, and B. returned home, resumed his duties as bartender, and died on Dec. 26, 1890, after an illness of seventeen days.

The physician who attended this man in his last sickness kindly furnished the following letter of Dr. W. G. Rogers:

December 8, 1890. Called to see N. P. B.; violent headache, chiefly frontal; pain in upper lumbar and lower dorsal spinal regions; some tenderness on pressure over liver and kidneys; obstinate constipation and vomiting; pulse 60, temperature 100 degrees F., respiration 18; head too hot. Treatment active, according to indication. December 9, condition same.

December 10. Bowels moved, nausea and vomiting less; pulse 56, temperature 99.5; headache and pain in back less. Treatment continued.

December 12. Violent headache and great restlessness; pulse, temperature and respiration same. Morphia hypodermically and other treatment continued.

December 13. Had slept well and appeared better; complaining of numbness of extremities and inability to turn on left side on account of pain; condition of extremities is paretic rather than paralytic; skin reflexes exaggerated on each side of dorsal and lumbar spines and more on right side; tendon reflexes of legs exaggerated also, especially the right leg; pulse 50, temperature 98; constipated; no vomiting.

December 15. Pain in head and back more severe and restlessness very great, with some delirium.

December 16. Headache severe, some delirium and much drowsiness; pulse 48, temperature 97; electrical reaction almost normal, but rather less on right side; aroused from stupor only by strong current, but soon relapsed into comatose condition.

December 17. Pulse feeble and irregular and 52; temperature 97.5, respiration 30; gave digitalis nux vomica, whisky and milk.

December 18. Pulse strong and regular, 50; temperature 97.5; respiration 18; bowels constipated; headache and pain in back still severe, but lessened by application of electricity—don't say what current—to spine and extremities each morning and evening; tendon reflexes still exaggerated; tongue dry, as it has generally been and made more so by his mouth-breathing; stupor great, though he takes medicine and food; difficulty in talking.

December 19. Condition unchanged; has to be raised to pass urine, which, however, is abundant but high colored, acid, free from albumen and sp. gr. 1025.

December 20. Condition same; gave mercuric chloride and iodide potass. every four hours and rubbed mercurial ointment into axillæ and groins; supporting treatment continued.

December 21, 22, 23, 24 and 25. Condition remaining same, save that stupor increases, temperature never rises over 99.5 degrees F.; respiration gradually increases to 40 and pulse to 80.

December 26. Temperature 101; coma; death.

Autopsy—Section of cranium on horizontal plane at supra-orbital ridge and the contents carefully removed. The tissue lining the frontal sinuses attracted attention, and were lifted out, leaving the bony surfaces of the sinuses bare. The brain surface appeared normal in the main; arteries empty, veins filled with fluid blood; dura slightly thickened in middle line at the position of the transverse suture. On the base of the skull the sella turcica was observed filled with a gelatinoid substance, and the anterior surface of the pons varolii was covered with the same material. The spinal cord on entering the foramen magnum presented anteriorly beneath the dura a good deal of gelatinoid, purulent looking material; this was particularly observed along the course of the blood vessels.

Posteriorly, on the under surface of the cerebellum, and between its lobes, were deposits of the same material. On separating the hemispheres of the cerebrum in front and below there was an escape of a pus-like fluid evidently coming from the ventricle.

Section of cerebellum showed nothing abnormal. Section of cerebrum on a level with under surface of corpus callosum exposed the anterior bone of the left-lateral ventricle, which was filled with a thick pus-like fluid, and its lining membrane seemed thickened. Horizontal section of middle lobe on same plane showed the descending bone of left ventricle filled with same fluid, thick and semi-gelatinous. Section of posterior lobe on plane ½ inch above preceding showed the horn on left side filled with same material, and the surrounding tissues disintegrated and softened. Above and outside the end of this posterior horn were numerous points of extravasated blood, showing rupture of small vessels; all surrounding tissues softened and infiltrated with pus-like material. On the floor of this posterior horn (left ventricle) was a space, evidently enlarged by degenerative processes, one inch square, covered by thick gelatinoid material, and finally, following the direction of the posterior horn of the left-lateral ventricle backward, upward and outward, was an abscess cavity as large as a walnut. Horizontal section of the right hemisphere on a level with the section of the left showed the right ventricle full of pus-like fluid, the choroid plexus involved in a gummy material, and the roof of the cavity showed an engorged condition of its blood vessels. No degenerative changes observed.

The spinal canal was opened and no evidence of any abnormal condition discovered till the fourth lumbar vertebra was reached. The canal from the level of the upper surface of the body of this vertebra, for two inches in a downward direction, showed the arachnoid of the cord, and its pia-mater injected, though the surface of the cord itself appeared normal. The arachnoid when teased out looked very much as if it had been soaked in bloody serum. The dura and the contiguous bony surface appeared healthy. Examination was carried no further.

The following report of Prof. Paul B. Barringer, M. D., of the University of Virginia, necessarily forms a most important part of this paper:

"On Dec. 28, 1890, I received from Dr. Hugh F. Nelson of Charlottesville, Va., a vessel bearing the following label, and containing the following parts: 'Right choroid plexus, baselar artery, middle meningeal artery, tissue from lumbar portion of the spinal cord.' The label also bore the initials 'N. P. B.'

"As soon as I received the vessel I noticed in the bottom of the clear fluid a sediment some one-eighth of an inch thick, and taking a clean pipette, I placed some of it under a cover glass for inspection. The microscope showed what seemed to be large quantities of pus cells, and many giant cells, some of them containing half a dozen or more enclosed cells. I stained a few of these giant cells to resolve better their internal structure and tested the pus-cells by acetic acid, methyl green stain, and by measurements I found them to be about eleven micra in diameter on an average.

"Having learned that the tissues were in an aqueous solution of bichloride of mercury about one in 500 strong, and wishing to cut sections of many of the specimens, especially the blood vessels, I transferred the specimens to a fluid made up of equal parts of alcohol, glycerine and water for better keeping. From this fluid I took the specimens at various times to study.

"1. The right choroid plexus. This was hardened in alcohol by slow stages of increased strength, and embedded in parafine. Twenty-five or more sections cut at various points showed nothing abnormal.

"Basilar artery—This was the part of the basilar after its formation and before its division, the terminal and way side branches being trimmed close. The same treatment and examination as in one gave a similar result.

"3. Middle meningeal artery—This vessel had been seemingly torn out by pulling upon its main trunk, and it had brought with it many of the smaller branches and arterioles. After hardening in the manner described, as I did not wish to cut the vessel at any point, I folded it many times upon itself to bring it within the limits of my embedding box. Each section therefore showed the large and small vessels side by side. In this case there was decided thickening of the intima of the smaller terminals, which showed in marked contrast to the thin intima of the large vessel in the same section. There was a complete absence of any of the granular masses of cells so often seen in the other coats in connection with the thickening of the intima.

"4. Tissues from the lumbar portion of the spinal cord—I found the tissues described under this head to consist of some six inches of the spinal cord, several inches of the meninges irregularly cut, and the greater part of the body of one of the lumbar vertebræ. Before going further I will say that sections of the cord were cut at different levels and no morbid appearances were noted. The meninges were examined only superficially and no sections were cut. The point of interest about the specimen lay in the fact that while the pus-cells which formed the sediment in the original fluid were simply adherent to all the parts previously examined, here was found an inflammatory focus from which at least a part of the purulent element of the fluid could have come. The concellated tissue of the body of the vertebræ was to to the naked eye decidedly redder in tint at a certain place than at others. The fractured surface of this bone showed with low power and reflected light a general infiltration such as we would expect from an inflammatory exudate and in all parts of the softened area pus-cells were abundant. I was extremely anxious to know if the giant cells came from this region, I therefore took a hypodermic needle, and inserting it deeply down into the area of softening, washed out into a watch glass the liquified elements from the deepest parts of the diseased bone, and the most careful examination failed to find any of the giant cells found in the original fluid. In it, however, were found pus-cells in abundance of the same optical character, and giving the same measurements as those in the general sediment of the jar. I am in ignorance of the point of origin of the giant cells.

"While this work was going on I learned that special interest in the case had ceased, and hence I carried the examination no further. No examination was made for pyogenetic bacteria, and hence I can say with no certainty as to their presence or absence except on general principles."

Case 2—For which I am indebted to Dr. William H. Cyrus, of Palatka, Fla.

"W. H. M., a passenger conductor on the G. S. & F. R. R., fell from his train at Valdosto, Ga., Jan. 20, 1892, while running at the rate of ten miles an hour. He did not feel that he was seriously hurt, and continued his run to Palatka. The next day he consulted me in regard to a severe headache which he attributed to biliousness. He mentioned the fall, but stated that while he was considerably shaken up, he did not think his head had struck the ground. It had ached ever since.

"There were no marks of external injury about his head, and his tongue being covered with a white fur I prescribed a cathartic, which he afterwards told me acted freely and gave some relief.

"He continued on duty till Feb. 20, when he gave up and went to bed, and on the next day sent for me. I found him with a temperature of 102 degrees, tongue heavily coated with a dark yellow coating, frequent vomiting of billious matter, and suffering with an intense frontal headache, which he said he had not been entirely free from since I had seen him before. In a few days, feeling better, he worked his train to Macon. On his arrival at that place he felt so ill that he returned to Palatka in a sleeper. Dr. Welch and I attended him constantly from that time until his death, which occurred April 11, 1892. During his entire illness he complained of severe frontal headache and nausea, and had frequent vomiting; tongue covered with a dark yellowish-brown coat; temperature during this period subnormal, ranging from 97 to 98 degrees.

"We early in the case made a diagnosis of cerebral abscess, and watched carefully for symptoms of paralysis which might indicate its location, but none were ever present. He answered questions slowly, but correctly; bowels constipated, and urine towards the last contained some sugar. There were no convulsions, but sometimes muscular tremors when aroused from sleep. For several days prior to his death his pulse ran at 40 per minute. Autopsy, twenty-four hours after death. Meningeal vessels engorged with blood. An abscess was found in the white matter of the left frontal lobe extending from the gray matter back of the frontal commissure to the left lateral ventricle, containing something over two ounces of pus, and surrounded by broken down brain substance. The lateral (3 degrees and 4 degrees) ventricles had flakes of lymph attached to their walls which were also engorged with blood. No marked increase of fluid in the ventricles. No examination of the spinal cord was made.

"There was no history of syphilis, or any evidence of it in the case."

Case 3—I. I., a young negro tramp, aged about 25, while at work unloading cars in a coal yard, was reported by his fellow workmen to have had a fit and fallen. May 25, 1888—immediatety after the attack—he was carried to the hospital here and was in profound coma when seen; could not be aroused; reflexes all gone. Glandular system much involved, especially inguinal, epitrochlear and post-cervical glands. An induration on penis, back of corona glandis, and mucous patches on prepuce.

Death occurred during the night, and the next day post mortem examination revealed an enormous mass of black, clotted blood in the posterior lobe of the right cerebral hemisphere, the rupture occurring from a branch of the posterior cerebral artery. The clot was a mass of the size and shape of the two hands placed in contact at their finger tips and thenar eminences—ovoid. The locus of the clot looked as if it had been cut with a knife. No microscopic examination was made of any specimens.

Case 4—M., fireman C. & O. Ry., aged 24, married. Was called to see the man from the house of a private patient close at hand. Found him in a convulsion; snapping the teeth and eyelids, frothing at the mouth and tendency to opisthotonos. Was informed that another physician had been sent for, so gave him a controlling dose of morphine sulphate hypodermically, and, his family medical attendant coming in soon after, I informed him what I had done, and turned the case over to him. At the same time I told the medical gentleman that I feared M. was syphilitic.

While in the house I was told that the man had seemed irrational after both his last two trips on his engine, and his wife said he did not know what he was doing when he went out on either of the trips. On my return home I informed the chief surgeon of the C. & O. Company by letter of this man's condition and my acquaintance therewith. The physician in charge of M.'s case treated him vigorously with potass. iodide and mercurio chloride, and after some two months he was up and about. My acquaintance with the case after this was due to the fact that M. was forbidden to resume his duties as fireman till I pronounced him ready to work. I consulted several times with his medical attendant, and after some eight months allowed him to be employed on the shifting engine in the yard at Charlottesville. Subsequently I recommended that he be allowed to go out on the road, and my recommendation was complied with.

Case 5—T. H., civilian, aged 43, contracted syphilis four years before circumstances here related.

In May, 1888, while lifting a weight in an awkward position he felt something crack in his back, and on releasing his hold on what he was lifting, was with great pain and difficulty able to resume the upright position. He went home, however, and got quiet, and for several days went about on crutches, as the weight of his body on his lumbar spine was at first such as to incapacitate him for getting about without them. In eight or nine days he had so far recovered as to discard his crutches, and soon to forget all about his strain. On Nov. 3 of same year he took a trip involving a ride of about two hundred miles on a railway. He took his train at 3 a. m. on the day mentioned, and had no sleep before beginning his journey. Before reaching his destination he began to suffer violently with headache and pain in his lumbar spinal region, and on going to a hotel after leaving the cars had a physician.

The pain in the back and limbs became intolerable; did not sleep at all that night; and found that sensation was lost on the inner side of the left gluteal region, perineum, scrotum, penis, thigh and leg. No impairment of motion, though he had had a right facial paralysis two years before. Defecation was performed without consciousness that the sphincter ani muscle was on the stretch, and though he had desire to defecate, and felt relieved after going to stool, except for the presence of fecal matter on the surface of the water in the closet, he could not have known that the accomplishment of his object had been attained.

November 4 walked about a good deal; in fact, was only comfortable when walking. Realizing his condition, he got a druggist to put up for him a mixture, each dose of which represented iodide potass. grs. xc, and mercurio chloride grs. 1-16. This was what he had taken when his facial paralysis appeared. Slept none that night and the next day went home. Was actively treated—anti-syphilitic—and soon got "all right."

Case 6—H., crossing watchman at Charlottesville, aged 71. Sixteen years ago, when he was a train dispatcher on the C. & O. Ry., he contracted syphilis, was treated and thought himself cured. Two years and a half afterward on retiring one night he felt as well as ever in his life, but on waking the next morning he tells me that he had a sensation as if needles were sticking in his legs. On attempting to get out of bed he found himself unable to walk or even to stand. Some improvement has followed, as he now gets about the streets with an ataxic gait, and has sufficient use of his arms to raise and lower the gates at the crossing.

In five out of six cases here recorded we have clear histories of syphilis. In three out of these, autopsies were made, and characteristic lesions were discovered in two. In the case reported by Dr. Cyrus there was no history of syphilis and no evidence of its existence at the autopsy. No microscopic examination was made known, and the flakes of lymph along the walls of the lateral ventricles look suspicious.

It should also be borne in mind that many persons will be offended at an imputation of syphilis and will stoutly deny it even when evidences exist which leave no doubt in the case. In one of these cases suit for damages was brought, but compromised; case 6 is a pensioner of a railroad company.

Mr. Erichsen's lectures on "Spinal Concussions," which have been the handbook of anti-railroad lawyers for the past quarter of a century, are wonderfully silent on the part played by syphilis in the outcome of serious results from injuries received on railroad trains. Both Page and Clevinger have taken Mr. Erichsen's book as a text and discussed its merits. Page cites instances in which specific infection must have taken part in the result of so-called spinal concussion; while Clevinger, in the final chapter of his book, writes as follows, differentiating spinal concussion from the results of syphilitic lesions of the cord·

"Syphilis may cause a great array of spinal disorders, mainly such as are induced by neoplastic growths in general, such as membrane thickening, pressure symptoms, interferences with cord functions at various levels through disseminated or localized gummata, but there is no tenderness of the back or inability to rotate or flex the spinal column; the insomnia does not exist, and syphilis cannot cause Erichsen's diease, nor a sufficient portion of its symptom grouping not to be distinguished apart. Fleeting and excruciating pain and paralysis characterize syphilis, and there is a syphilitic insanity recognizable by alienists."

Page, "Injuries of the Spine and Spinal Cord," second edition, page 49, after citing a case of Mr. Hutchinson's of a girl with inherited syphilis, who at the age of sixteen had a severe fall, receiving spinal injury, says: "* * * * A converse explanation is at hand; that had it not been for the syphilitic element the concussion symptoms of the cord would not have run on to myelitis and would have been therefore unrevealed. At the same time the original lesion may have been a small hemorrhage, * * * * * insufficient of itself to induce immediate paraplegia; and the inerited vice of syphilis only paved the way for the supervention of inflammatory action from an otherwise inadequate cause." Page, Op. Cit., pages 137, 138, says: "And here we must again observe how frequently syphilis lies at the root, as it were, of any actual disease of the membranes of the spinal cord. There was a case under our observation in hospital not long ago where injury was said to have given rise to various symptoms, * * * * but in reality the injury was wholly inadequate to produce such a result, and there was a very distinct history of syphilis, and the symptoms had more than once been lessened and almost recovered by the administration of antisyphilitic remedies. And although from a medico-legal point of view the presence of a syphilitic taint does not debar the sufferer from compensation for injuries received, such taint must of necessity be acknowledged if we are to form a correct estimate of the probabilities there may be of recovery in any particular case."

Clevinger, quoting Dana—Op. Cit., pp. 59, says; "Dana too has cited a case where tabetic symptoms followed a railway accident to a syphilitic subject; where he thinks the accident determined the localization of the morbid process."

It is not within the scope of this paper to attempt any discussion of the views of Mr. Erichsen, Page or Clevinger in regard to so-called spinal concussion. We only want to add to the testimony already adduced in support of the relation of syphilis to railway injury. Dr. R. Harvey Reed, editor of the surgical department of *The Railway Age*, kindly published for us the following interrogatories, with the request that any reading them would reply by letter if material was at hand:

1. General effect of railway injuries in syphilitics as compared with injuries of same nature in non-syphilitics coming under observation.

2. In case of so-called "railway spine" coming under your observation in practice, or in which you have been called upon to testify as expert, has the question of syphilitic taint been raised? If so, in what proportion of all such cases?

3. In how many cases of "suit for damages" for alleged railway injury without objective symptoms observed at time of accident have you been called to testify? If in any such cases, was the question of syphilitic taint raised, and if raised in how many was syphilitic infection proven or known to have existed?

4. In how many cases of alleged railway injury with either slight or no objective symptoms have you observed subsequent permanent impairment of physical or mental power? If in any how long after reception of injury; in how many such cases was syphilis known or proven to have existed, or was the question raised at all?

5. In how many cases of alleged railway injury with slight or no objective symptoms have fatal consequences ensued? If in any how long after reception of such injury did death supervene and in how many such was question of syphilis raised—proven or disproven?

6. In how many cases of alleged railway injury followed by death—immediate effects of injury having been slight or none—have autopsies been held? If in any what was observed with regard to spinal cord and brain?

7. In how many cases of alleged railway injury with slight or no objective symptoms immediately presenting has paralysis followed? If in any at what time after reception of injury did such defects begin to manifest themselves, in what degree did they progress, and in what proportion of all such cases was syphilis proven to have never existed?

Only two answers to these interrogatories were ever received; one, the case reported by Dr. Cyrus of Palatka, Fla.; the other a letter from surgeon Doyle of Seneca, S. C., from which I quote as follows: "I have a case under treatment at this time that well illustrates the tediousness of recovery from trauma in syphilitic subjects."

The determination of the localization of tertiary syphilitic lesions, or rather the causes at work in effecting the localization of such lesions, are frequently very obscure. Yet we do know the neoplastic granulation tissue, forming the so called gummata, develops readily in the locus of a contusion, congestion or extravasation. In my own experience syphilis of the lung has followed a slight congestion, tibial ulceration set up in a contusion of the shin in a syphilitic subject: granulated tissue formed at the locus of a slight hemorrhage in the menenges of the spinal cord.

Senn—"Principles of Surgery," p. 210 says: "Chronic suppuration occurs as result of infection with pus microbes of a pre-existing pathological product composed of granulation tissue. In such cases the embryonal tissue is the product of a specific inflammation caused by the presence of micro-organisms which possess no pyogenic properties, but which excite in the tissues a chronic inflammation, the product of which consists of granulation tissue. The bacillus of tubercolosis, the microbe of syphilis, and the actinomyces are good illustrations of this class of microbes. If a lesion caused by any of these microbes become the seat of infection with pus microbes, the latter and their ptomaines are brought in contact with cells which are readily converted into pus corpuscles.

Senn—Op. Cit., p. 439—also cites Baumgarten as having found giant cells in gummata.

Plainly an injury to a syphilitic subject even though a slight one is a matter of grave consideration, not only for the general and railway surgeon, but more especially for those persons to whom is entrusted the selecting of employes for railway companies. A soldier once enlisted, if he becomes sick either from disease or result of injury while serving his term of enlistment, is a pensioner upon his government for life. The same is true of railway employes, and frequently when the railway companies object to pensioning an injured man court and jury force it to do so. Recruits are subject to rigid physical examination before they are allowed to enlist; why should not the same be exacted of recruits for the great army of men employed by the various railroad companies of our country?

This question is an important one, more particularly when we see that the question of syphilis will not avail before the courts. Not only should railway companies refuse to accept syphilitics as employes, but the men employed should be subjected to regular inspection and discharged if found syphilitic. A man may acquire tuberculosis while in the legitimate discharge of his duty as an employe of a railroad company. He cannot so acquire syphilis. Our chief surgeons should see that this question is investigated, and in this way a great deal of the wrangling between medical experts in cases of so-called "spinal concussion," or "railway spine, or "Erichsen's disease," will be avoided. Case books should be furnished all railway surgeons, in which the question of specific taint should be brought well out, careful examination being made in every case. The increased expense would be small and much more than compensated for by the saving to the companies of exorbitant sums paid in many cases when the individual injured and not the company is responsible for the results of slight injury.

Two Interesting Cases of Railroad Injury.

[By Dr. Webb J. Kelly, Galion, Ohio. Division Surgeon Erie Ry., and Surgeon C. C. C. & St. L. Ry.; professor operative and clinical surgery Ohio Medical University.]

In presenting the report of these two cases to your notice it shall be my object to give the facts as they were found rather than to advance any new theories of treatment. As you all know, a railroad surgeon of any considerable experience meets with almost every conceivable class and form of injury. The two cases which I have the honor to report are those of "Compound dislocation of the astragalus with rupture of the posterior tibial artery," and "Rupture of the urethra, with subsequent perforation of the perineum." These cases are both rare injuries, many surgeons never having met with either, and I will assure you they need not be anxious to meet with either form, as they are not only dangerous in their character but are such as necessarily cause much annoyance and constant attention.

G. H., aged 24 years; six feet two inches tall, brakeman; was running ahead to open a switch when he slipped and fell through an open culvert, striking with the bottom and one side of the foot against the opposite side of the culvert. Dr. Wuchter of Wadsworth was called to see him, and upon examination found a compound dislocation of the astragalus. The head of the bone was driven outward as shown in the accompanying illustration.

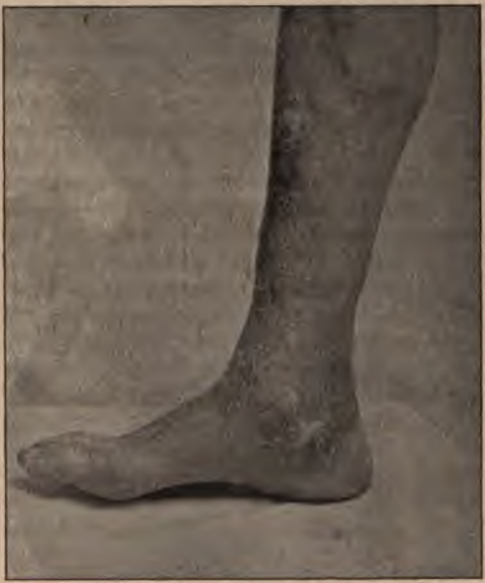


Fig. 1. Compound Dislocation of the Astragalus.

The ligaments, tendons and soft parts held it in this position in such a manner that reduction by manipulation or by extension was an utter impossibility, as Dr. Wuchter found by experience. Failing to reduce the dislocation he brought the patient to his home in Galion, where I saw him ten hours after the accident happened. Drs. Hackedorn, Campbell and H. R. Kelly were called in consultation, and after failing to accomplish anything in the way of reduction by ordinary means Dr. Kelly suggested the advisability of amputating the exposed bone. This I did with the aid of an ordinary Hays saw, removing fully one-third of the astragalus. You would be surprised how easily the foot slipped over into place after this was done. Here a new emergency showed itself. The posterior tibial artery had been ruptured, either at the time the foot was dislocated or else during the process of extension and manipulation, and when the pressure was removed by the amputation of the bone the blood spurted out with full force. Considerable difficulty was experienced in ligating the artery and checking the hemorrhage, but this was finally accomplished and the foot dressed antiseptically. The young man being a nephew of Dr. Hackedorn, he attended the case jointly with me.

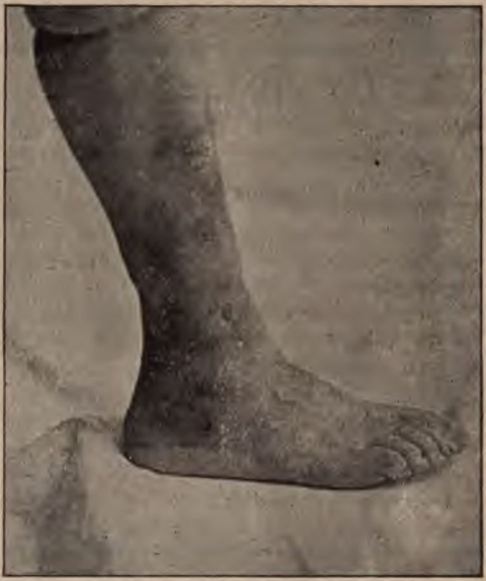


Fig. 2. Compound Dislocation of the Astragalus.

Inside of 48 hours the whole limb was swollen and red up as far as the knee. We were compelled to fight a very severe case of phlegmanous erysipelas. He was given quinine and iron pretty freely and the local symptoms were treated with free incisions and by the use of peroxide of hydrogen. Of the latter I can say that in this case it acted very nicely, and I think was one of the prime factors in the saving of the limb. I wish here to caution the profession against the too free use of this agent, as it was clearly demonstrated time after time in this case, the man being a good bleeder, that when used too strong it would produce severe hemorrhages, and at times to an extent that was alarming. We worked with the limb for several months and finally had the satisfaction of seeing it heal up. He now has good use of it, as you can see by the accompanying illustration taken from a photograph. There is very little deformity and he is able to fire a locomotive.

Ashhurst, in his recent work, advises against an attempt to save the foot in these cases, stating that the risk to life is too great, and illustrates it by giving the report of two cases in his own practice which were failures. It is true we had a good, healthy subject to deal with; still I am under the impression that I would follow pretty much the same treatment in the next case that came under my care. In this dislocation the bone is buttonholed, and it is simply a question whether you will weaken the foot more by cutting the ligaments and tissues sufficiently to permit of reduction, or by amputating the bone. In this case amputation gave a good result, and as it is the only case of compound dislocation of the astragalus that I have ever met with in my practice, I am unable to say what the other expedient would do.

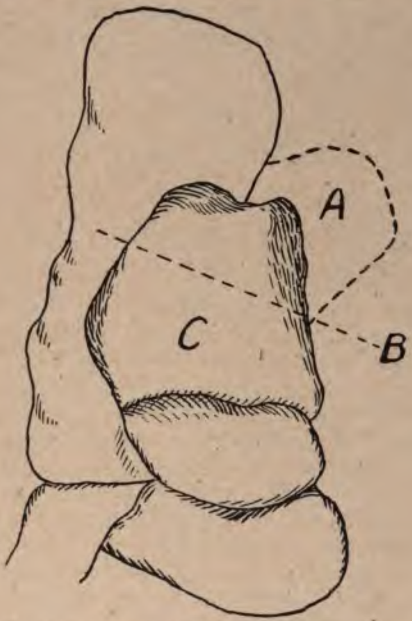


Fig. 3. Compound Dislocation of the Astragalus.

Robert G., a young man in the employ of the Erie railway, attempted to cross in front of a moving car. He missed his calculations and was struck by the car, knocked down and run over. The brake rod struck him in the perineum. He jumped up and attempted to work, but in a short time he was compelled to go home, which was but a few steps from his work. I was called and found he had suffered some hemorrhage from the urethra before my arrival. On examination I found he had suffered two ruptures of the urethra—one about one inch back from the meatus and the other in the membranous portion. The ruptures were quite extensive and on the lower surface of the urethra. There was a small pink spot on the surface of the perineum, but no perforation. I introduced a catheter and allowed it to remain until the next day, when it was removed. During the next few days it was only allowed to remain for an hour or two at a time. This was done because he complained bitterly of the irritation produced by its presence. At the end of the fourth day sloughing of the connective tissue in the perineum took place to such an extent that a large opening formed and it became necessary to cut away large pieces of broken down tissue. The urine was passed through this opening and infiltrated into the tissues surrounding it. The scrotum became swollen and full of urine, which was relieved by free incision. The parts were thoroughly cleansed with a mild solution of permanganate of potash, injecting it into the scrotum and through the opening in the perineum quite frequently. At the end of three weeks he was able to be around the house. Solid bougies were then passed into the urethra daily for a period of probably two months. The opening in the perineum closed entirely, and the stricture is very little if any. At this writing, eight months after the accident, he says he experiences no difficulty in urinating, and to all appearances is perfectly well. The only remarkable thing in this case is the fact that we were unable to keep a catheter in the urethra and still have the wounds all heal. I expected to show a photograph of this case, but was disappointed, as the patient moved away just as I was ready to have it taken.

Railroad Dust in Railroaders' Noses.

[By Surgeon Hanau W. Loeb, St Louis, Mo.]

In the hurly-burly of a busy physician's life, there is ordinarily little time to consider the particles of dust which float so merrily in our atmosphere, lodging here and there, causing some little change by virtue of the impressionable soil upon which they find a resting place or effecting no result—a barren soil. To keep them out of their newly made wounds, to destroy or the negative the power of spores and bacteria, commingled with the particles, should constitute the operating surgeon's relation to dust; but while this is so essential to the proper healing of wounds, thanks to the refinements of modern surgery the whole matter is an open book, where he who wills may drink deep of the truthful words and may act upon their dictum,

But to the laryngologist and rhinologist who may perhaps belongto a less perfect branch of medicine, the question is of greater import, for air must enter the nose or mouth before it passes into the lungs; for a stream of air, fresh, pure or laden with the most vicious impurities must pass through these doorways to the lungs, sixteen to eighteen times every blessed minute of the day; and no man can protect the nose or pharynx as the surgeon does his wounds.

Through the grand perfection of nature, the nose, when normal, is thoroughly competent to accommodate itself to the various conditions of the atmosphere; so that, however cold, the column of air is sufficiently warmed before it reaches the pharynx; however pregnant with dust, it becomes filtered and pure before the end of its journey in the lungs; however dry, it becomes saturated with moisture.

Let but the nose be diseased or obstructed and how quick the transition from perfection to most serious imperfection occurs. The air, lacking in moisture, abstracts water from the pharynx and the dry throat so common in this land results, later followed by inflammatory conditions of the pharynx, larynx, bronchi and lungs. Similarly, the cold air which through abnormal circumstances passes through the nose, unheated, may cause inflammation all down the respiratory tract.

Into these features of the question it is not the purpose of this paper to wander; they are here mentioned, simply to emphasize the necessity of nose breathing under as thoroughly normal conditions as possible; truly healthful breathing depends upon this.

The filtering function of the nose merits, however, considerable attention on the part of one whose work is on the noses and throats of mankind and, especially, one who deals largely with that grand army of civilization, the railroader.

The specific work of railroad men throws them repeatedly under the influence of dust of all kinds. The engineers and firemen, freight conductors and brakemen have a surfeit of smoke, cinders and coal dust added to the dessiccated matters from the fields and cities through which they pass; in a less measure the passenger crews are subjected to the same influences. Shopmen, machinists, carpenters and painters contend with the special conditions favored in the construction or, too often, misconstruction of the shops and their locality, frequently down in a hollow and in a place, advantageous for impregnation of the atmosphere with smoke; in addition, but to a limited extent, the dust which arises from wood-working, metal-working, filings, sawdust and the like. Switchmen are susceptible to the dust from the dry clay upon which the track is laid and to the smoke and cinder, which so constantly encompass them. Clerks from their vicinity to the railroad tracks inhale this same dust and smoke-laden atmosphere. It is therefore evident that no class of railroad workers is exempt from the possibility of the pernicious influence of the heterogenous collection of solid impurities which I have grouped under the name of railroad dust.

Here, then, is the keynote for action; if the nose is a filtering agent of any utility, then the dust and solid portions of the atmosphere must remain in the filter, politely termed the nose. Wherefore, forsooth, these questions present themselves: Are these particles conservatively removed from the nose or are they sources of irritation?

It is reasonably certain that a perfectly normal nose, or one that approximates normality, could readily dispose of the solid particles left within it after filtration, and, by means of the normal secretion wash them away. But as noses free from abnormal conditions are exceptional, one must expect to find an interference, more or less serious, in the proper functionation of the nose and thereby an augmentation of whatever pathological state may be present.

A deflection of the septum or a septal spur is especially conducive to such a result, for in either case the current of air is bent and the nose can not, therefore, properly attend to the details of its function. Acute rhinitis is accordingly common, chronic rhinitis supervenes and hypertrophy or atrophy results. In any case where the sufferer is not removed from the pernicious atmosphere, and where no attempt is made to remedy the disease, the condition becomes progressively worse and each day less amenable to treatment.

When the nose is obstructed by spurs, polypi, hypertrophies or adenoids, and when on account of these, or of deflections, mouth-breathing results; or when, by reason of atrophy, the nose has no more effect upon the air than if it were a glass tube, the seat of interest and of woe to the patient is transferred to the pharynx, larynx and respiratory organs below. To the discomforts and inflammation produced by the lack of the physiological heating and moistening of the air is superadded the irritation which the dust and smoke occasion in passing through the air passages to the lungs. And it is safe to say that the conditions of anthracosis, calcosis and the like are produced just in this way, by inhalation through the mouth or through an abnormal nose.

The ulterior effects of this irritation caused by railroad dust are to the uninitiated and to those who have given little thought to the subject, at first sight surprising. In the category of diseases which are often traceable to this are the following: Acute and chronic rhinitis, hypertrophic and atrophic, naso-pharyngitis, acute and chronic pharyngitis, acute tonsillitis, follicular tonsillitis, tonsillar hypertrophy, elongated uvula, laryngitis, acute and chronic, bronchitis, acute, subacute and chronic and pulmonary inflammations.

Should the time ever come when all these disases have been demonstrated to be due to some form of bacteria, as come it may, the truth of what has just been stated will still prevail; for in such an event it will be proven that the irritation caused by the dust particles has contributed to the causation of the disease by rendering the tissues liable to the invasion of pathegenic bacteria. Again, what has been mentioned does not indicate that in every case these diseases are the result of such an irritation; far be it from my purpose to promulgate such an idea which has so little foundation in fact.

In addition, various reflex affections arise from these particles in the air just as under ordinary circumstances; such as those coming under the head of hay fever, reflex asthma, bronchial asthma, headache and reflex cough.

Any one may demonstrate the existence of this railroad dust in the nose by even a casual examination. In many cases the middle turbinated will be found covered with a black deposit; on this most sensitive portion of the nose it cannot but exert a most harmful influence. Discharges from the nose and expectoration after hawking and coughing will be found to contain large quantities of black or dark-colored deposits, which aside from the evidence of improper atmosphere will often appear to the patient to be the signal of an impending attack of consumption or some other dreaded disease.

When the secretion from the nose is abundant, it can in a measure accommodate this foreign matter and dispose of it; it is when from a lack of secretion, the deposit remains for a time that harm is occasioned.

The efficiency of treatment of this condition depends altogether upon the recognition of the condition demanding remediation and upon the thoroughness with which it is carried out.

Bearing in mind that it is only by making the nose approximately normal that it can be made to withstand the insiduous or active influence of this dust, efforts should be made in this direction. Polypi should be removed, deflections straightened where possible, spurs removed, adenoids destroyed and hypertrophies reduced. In this way the free passage of air is permitted and the discharges allowed to pass forward with ease.

Having made the way clear of obstruction, it is necessary to increase the secretion, if diminished, and to apply some agent which will prevent the dust particles from adhering to the mucous membrane. Similarly, agents must be applied to lessen the irritability of the nasal lining. I have long since consigned the use of watery solutions for spraying the nose to the past, so far as my own practice is concerned, and now seldom use them. So much better results have followed the use of oily agents and so much less harm is produced by their continued application. No better agent can be found than the liquid abolene or benzoinol, now so extensively sold.

The oily nature of the liquid renders the particles of dust easily removable and produces a feeling of comfort that is very acceptable to the patient. After making a few applications the patient is far better able to remove the discharges from his nose and he finds the whole organ more satisfactory in the performance of its customary functions. It is my custom in simple cases to use eucalyptol in combination with liquid abolene, ten drops to the ounce. In atrophic cases and in those cases bordering upon the atrophic condition or in which the mucous membrane does not furnish sufficient moisture or heat for the inspired air, it is my practice to prescribe menthol in gr. vij., x. or xv. to the ounce solutions. The menthol has the effect of stimulating the mucous membrane of the nose and of relieving the pain. While in cases where the secretion is considerable, it renders the nose sometimes uncomfortably dry, I have never found this a serious objection. It really seems to cause, in most cases, a dryness to disappear by its stimulative effect in face of its astringency. Camphor is often of service on account of its sedative and soothing action; in fact, I vary the agent used in connection with the liquid abolene, both singly and in combination, as each special case indicates.

For the thorough spraying of the nose (and understand if the use of the spray is to be of service it must be applied three or four times a day), there are a great many atomizers sold sufficiently cheap for any patient to purchase one. In my own practice, I have been using the A. S. Aloe Ointment Atomizer, which I find possesses advantages on the score of cleanliness and because it seldom gets out of order even after long and persistent use.

Even in cases where no operation has been performed in inoperable cases, treatment of this kind, while not curable, is at least beneficial and the results commendable. For it is certain that by means of such treatment the dust loses its power of irritation to the mucous membrane by reason of its dislodgment therefrom and the mucous membrane itself, by this bland and soothing application, returns as far as possible to the normal. It therefore follows that some form of atomizer should more frequently be prescribed, and with it a solution such as I have already indicated. By such means the comfort of many a poor sufferer will be insured, and there will be obviated many of the untoward effects of "Railroad Dust in Railroaders' Noses."

Traumatic Synovitis.

[By Surgeon W. T. Williams, Mount Carmel, Pa.]

Mr. President and Members of the National Association of Railway Surgeons:

The subject which I shall present to you is one of great importance. In bringing it before you I do not hope to bring anything new or startling. In fact, so much has been said and written concerning this disease, that it would be egotism on my part to attempt any important additions to the knowledge which we now possess concerning this affection. If, however, I can recall some familiar facts to your memories, and begin an interesting discussion, I will feel that my endeavors have not been in vain.

Before discussing the subject mentioned, we will understand it all the better if we make a few general remarks concerning the structure and formation of joints. In studying the various diseases of the joints, we have to bear in mind that we have to deal with the varied tissues of which the joint is composed. These tissues are distinct in their formation, their functions and their pathology, yet they are all so united for a special purpose that any disturbance of any one of them is sufficient to interfere with the harmonious working of the whole. A certain author has happily and graphically compared the various structures of a joint to a railway train, and as it seems peculiarly appropriate to this occasion, I will reproduce his description: "The osseous system is the foundation of the articulations, the cartilage or fibro cartilage or membrane interposed between the bones, to play the part of the buffers; of fibrous tissues or ligaments the coupling chains; of synovial membranes with their synovia the lubricating boxes and grease by which the friction is diminished; as well as of connective and adipose tissues, which serve as packing material to fill up the hollows."

It should also be borne in mind that the various muscles, with their tendons and synovial bursae, are important factors in the mechanism of the joints, and that the morbid process may also involve them. The various joints of the human body may become the seat of inflammatory affections of an acute or chronic character. The course of the disease will vary according to the cause and constitutional tendencies of the patient.

Of all joint affections the most common is inflammation of the synovial membrane, which may be acute, subacute and chronic.

Causes—Persons who have a predisposition to rheumatism, gout, syphilis or chorea, are more liable to take the disease than those who have not these tendencies. In such cases it frequently happens that more than one joint is affected at the same time. My experience is that traumatic influences are the most potent factors in the causation of this disease. Among them may be enumerated jumping from moving train, direct blows, bruises, sprains, falls, work that requires constant kneeling while performing it, especially if the ground be wet or damp, incised wounds, etc.

Pathology—In synovitis the inflammation is primarily confined to the living membranes of the joint. The usual changes of inflammation take place, viz.: increased vascularity of the membrane, with loss of its peculiar satiny polish. Hyperæmia and dilatation of the capillaries of the synovial membrane takes place. This is followed by an escape of white blood corpuscles into the intercapillary spaces and into the capsule. The synovia is then increased in quantity, becomes thin and serous, and after a time is intermixed with plastic matters which are poured out with it. As a result of this increase of synovial fluid, there is a distension of the capsule and communicating bursæ, and infiltration of the basement membrane with embryonic cells. In a majority of the cases inflammation is checked before any further damage is done to the joint. The fluid in the joint, as well as the escaped corpuscular elements are absorbed, and the normal function of the joint is restored. If, however, the conditions are not favorable, then the acute process will develope into a subacute and chronic inflammation, and finally a true *arthritis* may result.

Symptoms—The leading symptoms are those of inflammation generally, varying in degree with the amount of synovitis present, the causes producing it, the constitutional condition of the patient, and the individual joint affected, the symptoms being much more severe when hip and knee joints are affected. The position and construction of the latter joint cause it to be the most frequeut seat of the disease. Locally we have pain, which is generally more severe at night, is increased by moving or pressing on the articulation. It is usually sharp and lancinating when due to injury. In rheumatic or gouty constitutions it is of a gnawing character. The swelling varies with the amount of effusion into and around the joint, taking the shape of the synovial sack, which is modified by the degree of resistance of the surrounding structure. Heat and redness are more or less evident. Fluctuation, which at first is indistinct, becomes more distinct as the effusion increases. The position assumed by the patient in acute articular inflammation is the characteristic of the joint affected. The limb is usually semi-flexed as giving the patient most ease, and the joint cannot be moved without giving the patent excruciating pain. The constitutional febrile disturbance is tolerably severe, varying also with the cause and joint affected. In some cases the temperature runs up to 103 and 104 degrees, pulse is rapid, beating 120 to 130 a minute. Other cases are of a milder type, and do not present any serious condition and are therefore not alarming. The symptoms of subacute and chronic synovitis are far less severe in their character than in the acute form of the disease. The local condition is not so painful and there is but little constitutional disturbance. It is not the intention of the writer at this time to give a detailed description of these affections.

Treatment—The treatment is constitutional and local, and will depend on the severity of the symptoms and on the cause of the disease. If the patient is plethoric and of full habit, fever high, then the extraction of blood from the arm is advised, from ten to twelve ounces being deemed sufficient. If venesection is not admissible, then tablespoon doses of a saturated solution of sulphate of magnesia is advised until free catharsis is produced. The patient is then given a powder containing one-fourth grain of calomel and five grains of phenacetine every two hours, alternating with a mixture containing six grains of bromide of potassium, tincture aconite drops three, together with spiritus menderiri and nitre. These are continued until the temperature is reduced. The pain which is generally severe is controlled by the hypodermatic injection of the sulphate of morphia, one-fourth to one-third of a grain, every three to six hours. If after the acute symptoms have subsided the constitutional peculiarities of the patient manifest themselves, then he is given the appropriate remedy for his condition, be it rheumatic, gouty, syphilitic, or choreaic, and these remedies are used until the disease is eradicated. The local treatment is of great importance. In case of wound to joint, be it incised or lacerated, the parts are thoroughly cleansed with a 1-1000 bichloride solution, sutured. If necessary, iodoform is dusted on plentifully, the wound is covered with gauze and bandaged. The treatment is then instituted the same as if no wound existed. The most essential condition of local treatment is repose. The joint is placed in the position of greatest comfort to the patient, cold is applied by means of the ice bag over it. Sometimes it will be found necessary (when the cold seems too severe, or the bag too heavy) to allow cold water to drip on the affected joint from a bottle suspended from above by means of thread by capillary attraction. When cold is disagreeable, hot cloths may be placed around the joint. Among other useful remedies that may be employed are the lead and opium wash, solution of a sub-acetate of lead, etc. When the acute symptoms have subsided, compression by means of absorbent cotton and flannel bandage will be found useful. Occasionally, however, in spite of all our efforts the disease does not terminate in resolution, and it developes into the subacute and chronic condition. In these conditions the same principles of treatment must be adopted modified to suit the exigencies of each case. In these forms of the disease absolute rest is of the greatest importance. To insure this end the plaster of paris bandage is the best treatment. The joint is enveloped with a thin layer of absorbent cotton, the plaster bandages are applied over it, a sufficient thickness being applied to keep the joint firm and immovable. This plaster is renewed once or twice a week, according to the subsidence of the effusion, when as a rule it will be found to be rapidly disappearing. Occasionally (when the absorpion of the effusion is slow), the application of fly blisters, painting the joint with simple or compound tincture of iodine will be found beneficial. Due attention should also be given the constitutional treatment. Administration of the iodide of potassium, iron, vegetable bitters, good wholesome and nutritious food are important aids in the cure of this disease. The means enumerated have been satisfactory in my hands, but if notwithstanding, the effusion still persisted, I would not hesitate to remove the fluid by means of the aspirator. This can be safely done by using the customary precautions in not leaving any air into the joint, and using thorough antiseptics. The joint will remain tender for some time after the fluid has disappeared, some protection, therefore, to the serous membrane will be required. In the case of the knee joint, and elastic or canvas knee-cap is used. A light plaster bandage can also be used, eyelets can be placed in it and it can be laced. Either of these apparatuses are worn continually at first, then gradually discontinued as joint improves. The patient is instructed not to exercise his joint violently without this support. It is highly important that care be taken, lest the joint assume an improper position and anchylosis supervene. To prevent this, early passive motion should be resorted to at proper intervals, if necessary, extension by means of weights, should be applied. Attention to the points mentioned will almost invariably be satisfactory, and the surgeon will not have occasion to feel chagrined by meeting his patient on the street.

* * *

APPENDIX.

ROLL OF ACTIVE MEMBERS UP TO, BUT NOT INCLUDING MARCH 1, 1893.

The year Indicates the date they joined the Association.

NAME.	NAME OF RAILROAD.	DATE OF MEMBERSHIP.
Ames, A. A., Minneapolis, Minn.	M. St. P. S. S. M.	1888
Aikman, R., Ft. Scott, Kan.	Div. Surg. K. C. Ft. S. & M.	1888
Acheson. Alex.W., 1419 W.Woodard St., Denison, Tex.	Mo. Kan. & T.	1889
Alexander, J. T., Girard, Kan.	K. C. Ft. S. & M.	1889
Allen, Richard W., 1125 Main St., Dallas, Tex.	Mo. Kan. & Tex.	1889
Armstrong, E., Greenleaf, Kan.	Cent. Branch Mo. Pac.	1889
Alt, Adolph, 3036 Locust St., St. Louis, Mo.	Cons. Oculist Mo. Pac.	1889
Annis. E. L., 718 Michigan Ave., La Porte, Ind.	L. E. & W.	1890
Archer, J. D., 87 Railroad Ave.. Holgate, Ohio.	Ft. S. St. L. &. K. C.	1891
Alley, Wm. H., Forest City, Ark.	St. L. I. M. & S.	1891
Allen, Sam'l J., White River Junction, Vt.	C. V.	1891
Adair, John H., Owatonna, Minn.	C. & N.	1891
Alling, D. G., 29 W. 4th St., Dunkirk, N. Y.	L. S. & M. S.	1891
Appley, Wm. W., Cochecton, N. Y.	N. Y. L. E. & W.	1891
Acomb, James L., Tidionte, Pa.	W. N. Y. & Pa.	1891
Armstrong, John M., 243 Washington Ave., Ogden, Utah.	R. G. W.	1891
Agnew, Alexander W., Fayette, C. H., Ala.	R. & D.	1891
Anderson, A. B., Pawnee City, Neb.	C. R. I. & P.	1891
Armstrong, C., Carrollton, Ill.	J. & S. E.	1891
Anthony, Frank, Sterling, Ill.	C. & N. W	1891
Atkinson, Roger, San Marcos, Tex.	M. K. & T.	1891
Alderman, W. N., Athens, Ohio.	B. & O. S. W.	1891
Ainsworth, F. K., Los Angeles, Cal.	Div. Surg. S. P.	1891
Adair, A. W., Kellogg, Ia.	C. R. I. & P.	1891
Ayres, Sam'l, Room 31, Times Bld'g, Kansas City, Mo.	K. C. O. & S.	1891
Anderson, Thos. E.. Statesville, N. C.	R. & D.	1891
Airth, W. S., Live Oak, Fla.	F. C. & P.	1891
Arnold, Alfred L., Owosso, Mich.	M. C.	1891
Armstrong, E. A., Kokomo, Ind.	P. C. C. & St. L.	1891
Aloe, L. P., 3741 Pine St., St. Louis, Mo.	M. P.	1891
Allen ,W. S., Olean, Mo.	Mo. Pac.	1892
Adams, B. J., Morrilton. Ark.	St. L. I. M. & S.	1892
Ady, Emmett, West Liberty, Ia.	B. C. R. & N.	1892
Allen, Ethan, Stillman Valley, Ill.	C. M. & St. P.	1892
Anderson, J. R., Martinsville, Va.	N. & W.	1892
Abbott, Alfred J., Emmett, Mich.	C. & G. T.	1892
Alderson, M. E., Russellville Ky.	L. N. & O. M.	1892
Amiss, John B., Harrisonburg, Va	B. & O.	1892
Aldrich, D. W., 145 Main St., Galesburg, Ill.	C. B. & Q.	1892
Atwell W. F., Fifield, Wis.	N. P.	1892
Axline, J. D., Shawnee, O.	Chief Surg. C. S. & H.	1892
Arthur, C. S., Portland, Ind.	Div. Surg. G. R. & I. and L. E. & W.	1892
Adams, John C., West Superior, Wis.	U. P.	1892
Beasley, Geo. F., 62 Ferry St., Lafayette, Ind.	Asst. Surg. Wab., L. N. A. & C.	1888
Bennett, J. H., Wauseon, O.	L. S. & M. S.	1888
Beach, J. N., West Jefferson, O.	P. C. & St. L.	1888
Bennett, W. P., Crestline, O.	P. Ft. W. & C.	1888
Barth, Louis, Grand Rapids. Mich.	Asst. Surg C. & N. W.	1888
Botkin, L. C., Burgettstown, Pa.	P. C. C. & St. L.	1888
Brock, C. W. P., 206 E. Franklin St., Richmond, Va.	Chief Surg. C. & O.	1888
Booth, David S. Jr., 500 N. Jefferson Ave., St. Louis, Mo.	Con. Surg. M. P., I. & G. N.	1888

NAME.	NAME OF RAILROAD.	DATE OF MEMBERSHIP.
Bain, Frank D., Kenton, O.	C. & A.	1889
Barney, Ruben, 411 Jackson St., Chillicothe, Mo.	Div. Surg. C. M. & St. P.	1889
Bancroft, F. J., Cor. Stout and 14th Sts., Denver, Colo.	Chief Surg. Rio G. W.	1889
Bradshaw, John Franklin, Superior, Neb.	Mo. Pac.	1889
Bagby, Oliver, Vinita, Ind. Ter.	Mo. Kan. & Tex.	1889
Barrett, W. H., Harrisonville, Mo.	M. P., K. C. C. & S.	1889
Baxter, G. A., 118 McCalla Ave., Chattanooga, Tenn.	Div. Surg. C. S., A. G. S., E. T. V. & G.	1889
Best, A. J., Centralia, Kan.	Cent. Branch Mo. Pac.	1889
Beggs, G. W., 511 Fourth St., Sioux City, Ia.	I. C. and C. M. & St. P.	1889
Boulware, T. C., Butler, Mo.	Mo. Pac.	1889
Buchanan, J. G., 123 Arch St., Allegheny, Pa.	P. Ft. W. & C.	1889
Buchanan, J. J., Pittsburgh, Pa.	P. Ft W. & C.	1889
Buchard, C. T., Lindell Hotel, Falls City, Neb.	Mo. Pac.	1889
Buchley, John J., Missoula, Mont.	Chief Surg. N. P.	1889
Bullock, Frank E., Forest City, Mo.	K. C. St. J. & C. B.	1889
Burk, John P., California, Mo.	Mo. Pac.	1889
Burson, A. L., Fort Scott, Kan.	Local Oculist K. C. Ft. S. & M,	1889
Burres, W. F., Sidney, Ill.	Wab.	1889
Bryan, J. D., 332 S. Main St., Ottawa, Kan.	Mo. Pac.	1889
Buechner, W. L., Youngstown, O.	N. Y. L. E. & W.	1889
Bishop, W. T., Harrisburg, Pa.	Med. Ex. Pa. R. R.	1889
Begley, B. W., Inglefield, Ind.	E. & T. H.	1890
Bremerman, L. T., Downington, Pa.	Penna. Co.	1890
Breed, F. L., Seward, Neb.	F. E. & M. V. R.	1890
Brush, E. C., 81 Seventh St., Zanesville, O.	C. S. & H.	1890
Brown, H. B., Lincoln, Ill.	P. D. & E. and Ill. Cen.	1890
Bush, J. C. F., Wahoo, Neb.	Asst. Surg. U.P. and T.E. & M.V.	1890
Bloomfield, R. G., Toledo, Ill.	P. D. & E.	1890
Brannon, G. D., Crown Point, Ind.	Erie and Wabash,	1890
Barringer, J. C., Oskaloosa, Ia.	I. C.	1891
Barton, P. H., 117 N. Vermillion St., Danville, Ill.	W. & St. L. and P. R. W.	1891
Blakeslee, Wm. R., Forest City, Pa.	N.Y.L.E. & W. and N.Y.O. & W.	1891
Benjamin, Dowling, Camden, N. J.	Chief Surg. Pa. R. R.	1891
Boarman, Chas. V., 1104 Maryland Ave. S. W., Washington, D. C.	P. W. & B.	1891
Birdsall, Samuel, Susquehanna, Pa.	N. Y. L. E. & W.	1891
Burnett, J., Scranton, Pa.	D. & H.	1891
Bryant, D. C., Cor. 15th and Dodge Sts., Omaha, Neb.	Oculist U. P.	1891
Biddle, J. C., Fountain Springs. Pa.	L. V. & P. R.	1891
Baker, M. J., Hornellsville, N. Y.	N. Y. L. E. & W.	1891
Buechner, W. H., Youngstown, O.	N. Y. L. E. & W.	1891
Butler, Robt. W., Wampun, Pa.	P. & L. E.	1891
Baldwin, M. A., Cuthbert, Ga.	S. W. Div of S. W.	1891
Benedict, S. C., Athens, Ga.	R. & D.	1891
Bizzle, F. A., Arcola, Miss.	L. N. O. & T.	1891
Bouffleur, A. I., 738 Washington Boul., Chicago, Ill.	C. M. & St. P.	1891
Burford, Hugh, Brunswick, Ga.	E. T. V. & Ga.	1891
Banwell, W. H., Orleans, Neb.	B. & M. R.	1891
Brown, S. E., Eatonton, Ga.	C. R. R. & Ga.	1891
Burd, Edwin, Lisbon, Ia.	C. & N. W.	1891
Baldwin, G., Ruthven, Ia.	C. R. I. & P.	1891
Bell, Samuel, 359 Briten, St., Beloit, Wis.	C. & N. W.	1891
Beebe, Warren L., 419 Fifth Ave., St. Cloud, Minn.	N. P.	1891
Barr, J. C., 100 Main St., Mars, Pa.	P. & W.	1891
Bear, Alexander, Norfolk, Neb.	Asst. Surg. U. P.	1891
Bergen, A. C., 400 Fourth St, Sioux City, Ia.	C. St. P. M. & O.	1891
Brown, J. E., McConnelsville, O.	Z. & O.	1891
Budd, J.D., Two Harbors, Minn.	Chief Surg. D. & I. R.	1891
Bradford, T. S., Augusta, Ky.	C. & O.	1891
Buckley, Benj. T., Freeport, Ill.	C. & N. W. and I. C.	1891
Blaisdell, Geo. C., Contoocook, N. H.	B. & M.	1891
Bell, Frank M. Kelso, Wash.	Line Surg. N. P.	1891
Bowers, Asa B., Maquoketa, Ia.	C. & N. W.	1891
Bracken, J. K. W., Springville, Utah.	Past Surg. R. G. W.	1891
Boardman, H. P. Oakes, N. D.	N. P. and C. & N. W.	1891
Blalock, Wm. C., Kosse, Tex.	H. & T. C.	1891
Barrell, Chas. C., 2107 Postoffice St., Galveston, Tex.	I. & G. N.	1891
Brayton, Chas. E., Stonington, Conn.	Chief Surg. N. Y. P. & B.	1891
Brannon, F. H., Canal Dover, O.	C. L. & W.	1891
Bley Jr., George, Beardstown, Ill.	O. & M.	1891
Bascom, F. S., 435 S. W. Temple St., Salt Lake City, U.	R. G. W.	1891
Bowcock, R. L., Anniston, Ala.	R. & D.	1891
Branch, W. G., Bunkie, La.	T. & P.	1891
Blackmer, F. A., Albert Lea. Minn.	M. & St. L. and B. C. R. & N.	1891
Brawley, M. A., Frankfort, Kan.	M. P.	1891
Benninghoff, G. E., Bradford, Pa.	W. N. Y. & P.	1891
Black, F. M., Washington C. H., O.	B. & O.	1891
Byers, John E., Butler, Pa.	Penna.	1891
Boyle, J. J., Susquehanna, Pa.	N. Y. L. E. & W.	1891

NAME.	NAME OF RAILROAD.	DATE OF MEMBERSHIP.
Barnett, James R., Neenah, Wis.	C. & N. W.	1891
Brett, B. C., 231 S. Jefferson St.. Green Bay, Wis.	Dist. Surg C. & N. W.	1891
Brodnax, J. G., 264 W. Market St., Greenboro, N. C.	R. & D.	1891
Baker, R. B., Hickory, N. C.	R. & D.	1891
Brian, F. N., Boyce, La.	T. & P.	1891
Brown, Geo. S., 2029 First St., Birmingham, Ala.	K. C. M. & B.	1891
Bailey, D. L., Carbondale, Pa.	Asst. Surg. D. & H. C. Co.	1891
Bradley, Robert D., 303 Main St., Peoria, Ill.	P. D. & E.	1891
Butler, Theodore E., Glen Allen, Miss.	L. N. O. & T,	1891
Bizzell, B. W., 146½ Peachtree St., Atlanta, Ga.	R. & D.	1891
Barr, J. A., McKee's Rocks, Pa.	P. & L. E	1891
Brown, M. S., 416 N. Franklin St., Danville, Ill.	C. C. C. & St. L.	1891
Boynton, S. R., Sparta, Ill.	M. & O.	1892
Brown, Alfred J., Higbee. Mo.	M. K. & T.	1892
Barker, W. E., Chanute, Kan.	A. T. & S. F.	1892
Bogle, W. H., 500 Commercial St., Atchison, Kan.	Asst. Surg. A. T. & S. F.	1892
Bedell, C. V., Lamar, Colo.	A. T. & S. F.	1892
Brady, L. M , Oxford, Neb.	B. & M. R.	1892
Burruss, E. W., Holly Grove, Ark.	Ark. Mid.	1892
Bishop, L. A., Fond du Lac, Wis.	C. & N. W.	1892
Brown, Horace M., 418 Jefferson, St., Milwaukee, Wis.	C. M. & St. P.	1892
Brundage, Alfred H., 308 E. Main St., Xenia, O.	P. C. C. & St. L.	1892
Brown, Caleb, Sac City, Ia.	C. & N. W.	1892
Bond, L. L., Westside, Ia.	C. & N. W.	1892
Bacon, J. E., 404 W. Ave.. Waukesha, Wis.	C. & N. W.	1892
Brigham, C. B., Mills Building, San Francisco, Cal,	S. P.	1892
Bundy, A. D., St. Ansgar, Ia.	I. C.	1892
Bennett, J. W., Brookhaven, Miss.	I. C.	1892
Borroum , A. J., Corinth, Miss.	M. & O.	1892
Button, C., Meade, Kan.	C. R. I. & P.	1892
Byers, Frederick W., Monroe, Wis.	I. C.	1892
Belt, Chas., Batavia, O.	C. P. & V.	1892
Belcher, C. E., Munson's Station, Pa.	Beech Creek R. R. Co.	1892
Burnett, Theodore L., Los Angeles, Cal.	Chief Surg. L. A. T. Ry. Co.	1892
Braecklein, W. A., Higginsville, Mo.	Mo. Pac.	1892
Boise, Eugene, 74 Ottawa St., Grand Rapids, Mich.	Asst. Surg. G. R. & I.	1892
Boyd, Montague L., 159 Liberty St., Savannah, Ga.	Chief Surg. S. B.	1892
Brumbaugh, A. B., 523 Washington St., Huntingdon, Pa.	Penna.	1892
Blanton, Geo. W. Chauncey, Ga.	E. T. V. & Ga.	1892
Brown, Geo. H., Chanute, Kan.	Dist. Surg. M. K. & T.	1892
Beam, Watson W., Rolfe, Ia.	C. R. I. & P.	1892
Brighton, W. V. R., 60 Oliver St., Tonawanda, N. Y.	Dist. Surg. N. Y. L. E. & W.	1892
Barlott, I. C., Hooversville, Pa.	B. & O.	1892
Bromwell, J. E , Mt. Airy, Carroll Co., Md.	B. & O.	1892
Budge, W. H., Marshfield, Wis.	M. L. S. & W.	1892
Bowman, Alfred R., Sabinal, Tex.	S. P.	1892
Brown, John O., Minnewaukau, N. D.	N. P.	1892
Crouse, D. W., Waterloo, Ia.	Ill. Cent.	1888
Conn, G. P.. 130 N. Main St., Concord, N. H.	Chief Surg. C. & M. and B. & L.	1888
Chapman, W. A, Hastings, Neb.	B. & M. R.	1888
Campbell, T. B., West Lebanon, Ind.	Wabash and I. C.	1888
Chapman, Geo., Hudson, Mich.	L. S. & M. S.	1888
Carr, E. C., 428 Main St., Coshocton, O.	P. C. C. & St. L.	1888
Connor, H. J., West Superior, Wis.		1888
Caldwell, F. H., Sanford, Fla.	Chief Surg. S. F.	1888
Chesney, John A., Bucyrus, O.	P. Ft. W. & C.	1889
Conrad, Arthur, Crete, Neb.	M. P.	1889
Cokenower, Harvey L., Clarinda, Ia.	C. B & Q.	1889
Courtner, Walter, Brainerd, Minn.	Chief Surg. N. P.	1889
Coit, Geo. W., Missouri Valley, Ia.	Chief Surg. F. E. & M. V.	1889
Cole, Chas. K., 812 Madison Ave., Helena, Mont.	Chief Surg. Mon. Cent.	1889
Cory, A. L., 4136 Wabash Ave., Chicago. Ill.	L. S. & M. S.	1890
Callaway, L. H., 525 W. Arch St., Nevada, Mo.	M. P. and M. K. &. T.	1890
Christopher, D. I., Colorado Springs, Col.	C. R. I. & P.	1890
Chenoweth, W. J., Decatur, Ill.	P. D. & E.	1890
Childs, O. D., Akron, Ohio.	C. A. & C.	1890
Clark, A. M., 112 Lincoln Ave., Youngstown, Ohio.	P. & L. E. and P. W.	1890
Chaffee, Geo., 223 47th St., Brooklyn, N. Y.	L. C. & B. C., Long Island.	1890
Cooper, H. P., Atlanta, Ga.	Chief Surg. A. & W. P.	1891
Cross, E. W., Rochester, Minn.	C. & N. W.	1891
Cummings, D. S., Waseca, Minn.	C. & N. W.	1891
Curtiss, A. M., Buffalo, N. Y.	W. S	1891
China, Archie, Sumter, S. C.	Asst. Surg. A. C. L.	1891
Cavana, Martin, Oneida, N. Y.	N. Y. O. & W.	1891
Chassaignac, Chas., 115 Louisiana Ave., New Orleans, La.	I. C.	1891
Calkins, H. T., Petoskey, Mich.	Div. Surg. G. R. & I.	1891
Carothers, W. H., Hamline, Minn.	U. P.	1891
Charles, Joseph, 105 26th St., Newport News, Va.	C. & O.	1891
Carlton, Jas. M., Mt. Carmel, S. C.	G. C.	1891
Chapman, Norman H., Monte Vista, Col.	D. & R. G.	1891

NAME.	NAME OF RAILROAD.	DATE OF MEMBERSHIP.
Clark, Isaac E., Schulenburg, Tex.	S. P.	1891
Carter, D. D., Woodstock, Va.	B. & O.	1891
Chalker, W. R., Lake City, Fla.	F. C. & R.	1891
Carleton, Wellington, Rochelle, Ill.	C. & N. W.	1891
Chapple, Henry, Billings, Mont.	N. P.	1891
Crain, F. M., Doland, S. D.	C. & N. W.	1891
Cook, John R., Montana Mines, W. Va.	B. & O.	1891
Cochran, E. G., Tampico, Mex.	Asst. Surg. M. C.	1891
Cook, John A., Orting. Wash.	N. P.	1891
Clark, L. A., 305 Oak St., Rockford, Ill.	I. C.	1891
Cloud, A. S., Kiowa, Kan.	M. P.	1891
Cyrus, Wm. H., Palatka, Fla.	J. T. & K. W.	1891
Chitwood, Joshua, Connersville, Ind.	C. C. C. & St. L.	1891
Core, C. B., Solomon City, Kan.	U. P.	1891
Crain, F. W., Sheldon, Ia.	C. St. P. M. & O.	1891
Cole, H. B., Black River Falls, Wis.	C. St. P. M. & O.	1891
Coe, Henry W., Hibernian Bldg., Portland, Ore.	N. P.	1891
Craven, Thos. H., Canon City, Colo.	D. & R. G.	1891
Clark, P. J., Oakland, Neb.	C. St. P. M. & O.	1891
Chandler, C L., Lenox, Mich.	Local Med. Officer G. T. R. & M.	1891
Clark, Sam'l W., Oskaloosa, Ia.	C. R. I. & P. and I. C.	1891
Cowles, A. G., Durand, Mich.	G. T.	1891
Coe, Wm. G., North Yakima, Wash.	N. P.	1891
Caldwell, Wm., 215 Front St., Fremont, O.	L. S. & M. S.	1891
Campbell, R. F., Watertown, S. D.	C. & N. W.	1891
Connelly, J. W., Farmington, Ill.	I. C.	1891
Calvin, J. H., Huron, O.	W. & L. E.	1891
Crawford, Thos. H., Rock Hill, S. C.	R. & D.	1891
Campbell, M., Parkersburg, W. Va.	B. & O.	1891
Casey, Wm. N., Seymour, Ind.	O. & M.	1891
Cunningham, W. M., Corona, Ala.	R. & D.	1891
Crawford, J. P., Davenport, Ia.	B. C. R. & N.	1891
Cook, E. P., Mendota, Ill.	I. C	1891
Cox, Joseph J., High Point, N. C.	R. & D.	1891
Cavaney, James, 409 Grand Ave., Milwaukee, Wis.	W. C.	1892
Culpepper, Vernon G., 516 Middle St., Portsmouth, Va.	N. & C	1892
Cooley, J. M., Beechtree, Pa.	B. R. & P.	1892
Chilton, S. B., St. Albans, W. Va.	Dist. Surg. C. & O.	1892
Cuddeback, W. L., Port Jervis, N. Y.	N. Y. L. E. & W.	1892
Carr, M. A. R. F., Cumberland, Md.	B. & O.	1892
Cartwright, J. W., Payne, O.	N. Y. C. & St. L.	1892
Cutter, J. D., Tomahawk, Wis.	C. M. & St. P.	1892
Corbin, F. E., Traverse City, Mich.	Div. Surg. M. & N. E.	1892
Cooper, St. Cloud, Jefferson, Tex.	T. & P.	1892
Coleman, R. H., Waynesboro, Miss.	M. & O.	1892
Cole, A Jerome, Britt, Ia.	M. & St. L.	1892
Clark, Eugene, Lockhart, Tex.	M. K. & T.	1892
Cristler, J. H., Childress, Tex.	Ft. W. & D. C.	1892
Corwith, Silas Rodgers, Bridgehampton, N. Y.,	L. I.	1892
Crandall, Geo. D., Blossburgh, Pa.	Erie.	1892
Cooper, Hugh M,, 509 Clarkson St., New Westminster, British Columbia.	G. N.	1892
Curtis, A. M., 503½ Austin Ave., Waco, Tex.	H. & T. C.	1892
Chandler, H. S., Canadian, Tex.	Santa Fe.	1892
Clark, A. L., Elgin, Ill.	C. M. & St. P.	1892
Connett, A. H., Great Bend, Kan.	Mo. Pac.	1892
Curless, Wm., Truckee, Cal.	Cen. Pac.	1892
Cowan, D. W., Hinckley, Minn.	E. M. & G. N.	1892
Carr, A. N., Jimulco Coahuila, Mex.	Asst. Surg. Mex. Cent.	1892
Cox, Geo. W., Brownsville, Ore.	Div. Surg. Southern Pac.	1892
Cobb, H. H., Goldsboro, N. C.	W. & W.	1892
Creel, M. P., Central City, Ky.	N. N. & M. V.	1892
Crowell, Joseph A., Iron Mountain, Mich.	C. M. & St. P.	1892
Deering, A. A., Boone, Ia.	Dist. Surg. C. & N. W.	1888
Dewey, Geo. M., Keytesville, Mo.	W. & W.	1888
Donnelly, James, Toledo, O.	Wabash	1888
Dawley, John H., Antigo, Wis.	M. L. S. & W.	1889
Donnell, Theophilus C., Franklin, Ind.	P. C. C. & St. L.	1889
Duggins, G. G., 420½ Santa Fe Ave., Pueblo, Colo.	M. P.	1889
Dye, A. A., 110 Gulf St., Lamar, Mo.	M. P.	1889
Davis, J., New Carlisle, Ind.,	L. S. & M. S.	1890
Day, W. C., 758 Main St., Danville, Va.	R. & D.	1890
Daugherty, P., Junction City, Kan.	U. P. and M. K. & T.	1890
Darby, D. B., Walhalla, S. C.	G. & C. and R. & D.	1890
Dinnen, J. M., Ft. Wayne, Ind.	Chief Surg. N. Y. C. & St. L.	1890
Doyle, O. M., Seneca, S. C.	R. & D.	1890
Doolin, Thos., Ashgrove, Mo.	K. C. S. & M.	1890
Dryden, R. C., Winslow, A. T.	A. & P.	1890
Dunham, J. D., Pattonsburgh, Mo.	Wabash.	1890
Davenport, Wm. H., Vincennes, Ind.	E. & T. H.	1890

NAME.	NAME OF RAILROAD.	DATE OF MEMBERSHIP.
Drake, N. A., 1001 Harrison St., Kansas City, Mo.	C. R. I. & P.	1890
Dale, J. R., 8700 Caddo St., Arkadelphia, Ark.	Chief Surg. U. T. A. & M.	1890
Duncan, J. A., 1107 Broadway, Toledo, O.	Div. Surg. Wabash.	1890
Daniels, C. M., Buffalo, N. Y.	N. Y. L. E. & W.	1891
Donnan, E. A., New Castle, Pa.	P. & L. E. and P & W.	1891
Daily, F. M., Beloit, Kan.	M. P.	1891
Duncan, B. A., West Point, Miss.	G. P.	1891
Day, Dwight W., Eau Claire, Wis.	C. M. & St. P.	1891
Davis, F. F., 111 State St., Oil City, Pa.	A. V.	1891
Dampier, C. E., 104 Broadway, Crookston, Minn.	G. N. and N. P.	1891
Darr, Hiram Henry, Caldwell, Tex.	G. C. & S. F.	1891
Dunscomb, Edward, Glenwood Springs, Col.	D. & R. G. and C. M.	1891
Darling, A. L., Topeka, Ill.	J. S. E.	1891
Dodge, Franklin A., Le Sueur, Minn.	C. St. P. M. & O.	1891
Devries, Joshua S., Fremont, Neb.	U. P.	1891
Dailey, W. E., 634 S. Wall St., Paris, Tex.	St. L. & S. F.	1891
Doane, Osmon D., The Dalles, Ore.	Asst. Surg. U. P.	1891
Dutton, S. W., McCracken, Kan.	M. P.	1891
Dodge, Amos P., Oneida Castle, N. Y.	West Shore.	1891
Donald. Alex., Germania Life Bld'g, St. Paul, Minn.	W. C.	1891
Dickinson, Daniel K., Lead City, S. D.	Chief Surg. B. H. & Ft. P.	1891
Davies, Wm. H., Maquoketa, Ia.	C. M. & St. P.	1891
Dean, Geo. R., Spartanburg, S. C.	R. & D.	1891
Dundass, Robt. C., Grand Rapids, Mich.	Div. Surg. C. & W. M.	1891
Daniels, W. N., Mosinee, Wis.	C. M. & St. P.	1891
Dickey, Wm. T., Vernon, Tex.	U. P.	1891
De Jernett, W. B., Commerce, Tex.	St. L. & S. W.	1891
Dice, J. B. F., Morristown, Tenn.	Chief Surg. M. & C. G.	1891
Doerr, J. E., 222 N. 8th St., Terre Haute, Ind.	E. & T. H.	1891
Davis, S. K., Libertyville, Ia..	C. Ft. M. & D. M.	1891
Duncan, J. B., Petersburg, Ind.	E. & I.	1891
Dillard, John W., 801 Church St., Lynchburg, Va.	N. & W.	1891
Darrow, E. M., 714 8th St., Fargo, N. D.	G. N.	1891
Davega, S. M., Chester, S. C.	R. & D.	1891
Davenport, H. E., Sheridan, Ind.	L. N. A. & C.	1892
Drayer, Peter, Hartford City, Ind.	L. E. & W.	1892
Davis, B. B., McCook, Neb.	Asst. Surg. B. & M.	1892
Dunn, A. A., Purcell. Ind. Ter.	A. T. & S. F.	1892
Dunn, L. D., 210 Sixteenth St., Moline, Ill.	C. R. I. & P.	1892
Donnelly, H. L., Latrobe, Pa.	Penna. Cent. and Branches.	1892
Drake, C. M., Knoxville, Tenn.	Chief Surg. E. T. V. & G.	1892
Davis, D. M., Sharon, Ala.	L. E. I. R. R. Co.	1892
Dent, W. M., Newburgh, W. Va.	Div. Surg. B. & O.	1892
Dunnott, Thomas J., Harrisburg, Pa.	Penna Co.	1892
Dixon, John N., Springfield, Ill.	C. & A., I. C. and O. & M.	1892
Domenzain, Franco G., Diermo No. 2, Silao, Guanjto Mexico.	Asst. Surg. Central Mexicano.	1892
Dale, Geo., Iola, Wis.,	G. B. W. & St. P.	1892
Dodson, N. M., Berlin, Wis.	C. M. & St. P.	1892
DuHadway, C., Jerseyville, Ill.	Chief Surg. St. L. C. & St. P.	1892
Evans, E. B., Greencastle, Ind.	C. C. C. & St. L.	1888
Everett, M. H., Lincoln, Neb.	Asst. Surg. B. & M. R.	1888
Evans, F. R., Franklin, O.	C. C. C. & St. L.	1888
Ewh, George, Talmage, Neb.	Mo. Pac.	1889
Eads, B. F. Marshall, Tex.	Chief Surg. T. & P.	1889
Eschback, H. C., Albia, Ia.	I. C.	1889
Elliott, Wm. H., Savannah, Ga.	Chief Surg. C. R. R. of Ga.	1889
Ellsworth, P. H., Hot Springs, Ark.	Chief Surg. Hot Springs Ry.	1889
Earle, Thos. T., Greenville, S. C.	R. & D.	1890
Eddy, J. W., 193 W. First St., Oswego, N. Y.	Ex-Chief Surg. R. W. & O.	1890
Eberhard, E. L., South Whitley, Ind.	N. Y. C. & St. L.	1891
Edie, Orton J., Grand Rapids, Mich.	L. S. & M. S.	1891
English, J. E., Baraboo, Wis.	Dist. Surg. C. & N. W.	1891
Ellinswood, A. G., Attica, N. Y.	N. Y. L. E. & W.	1891
Evans, C. D., Columbus, Neb.	B. & M. R.	1891
Emanuel, M. T., Weatherford, Tex.	T. & P.	1891
Estes, Wm. L., South Bethlehem, Pa.	Chief Surg. L. V.	1891
Engle, Theodore, State Centre, Ia.	C. & N. W.	1891
Edwards, A. G., Marysville. Kan.	Asst. Surg. U. P.	1891
Everhard, W. H., Volga, S. D.	C. & N. W.	1891
Epley, Frank W., New Richmond, Wis.	C. St. P. M. & O.	1891
Ettmueller, Gustav, Hermann, Mo.	M. P.	1891
Enfield, Chas,. Jefferson, Ia.	C. & N. W.	1891
Entricken, F. W., Findley, O.	T. C. & C.	1891
Eastland, John S., Judsonia, Ark.	St. L. I. M. & S.	1891
Edwards Jas. R., Denten, Tex.	T. & P.	1891
Estes, N. D., Alamosa, Col.	D. & R. G.	1891
Ellis, Wm. E., Ironwood, Mich.	W. C.	1891
Ewing. W. P., Charlestown, W. Va.	C. & O.	1891
Eddy, J. H., Wakefield, Mich.	D. S. S. & A.	1891

NAME.	NAME OF RAILROAD.	DATE OF MEMBERSHIP.
Evans, Wm. J., Groton, S. D.	C. M. & St. P.	1891
Evans, Franklin J., Chester, Pa.	B. & O.	1891
Evans, John M., Evansville, Wis.	C. & N. W.	1891
Emerson, George, Winfield, Kan.	A. T. & S. F.	1891
Eskridge, J. H., 4300 Emerald Ave., Chicago, Ill.	Chief Surg. C. R. F. & A.	1891
Ewart, Chas. R., Logan, Kan.	M. P.	1891
Enslow, C. R., Huntington, W. Va.	Dist. Surg. C. & O.	1891
Erwin, B. S., Mauch Chunk, Pa.	L. V.	1891
Eddy, W. J., Shelbyville, Ill.	C. & E. I.	1891
Ehrhardt, H., Beardstown, Ill.	Div. Surg. C. B. & Q.	1891
Engberg, A., McPherson, Kan.	M. P.	1891
Ensign, Wm. O., Rutland, Ill.	I. C.	1892
Ewing, W. M., Ottawa, Kan.	A. T. & S. F.	1892
Emmert, J. M., Atlantic, Ia.	C. R. I. & P.	1892
Elliott, A. B., Vanceburg, Ky.	Div. Surg. C. & O.	1892
Ellison, M. D., Canisteo, N. Y.	N. Y. L. E. & W.	1892
Estill, Andrew D., Lexington, Va.	B. & O.	1892
Essick, W. W., Murphysboro, Ill.	M. & O.	1892
Earle, G. W., Hermansville, Mich.	M. St. P. & S. Ste. M.	1892
Easley, Wm. T., Greenville, Ill.	St. L. Van. & T. H.	1892
Ellis, S. A., Staples, Minn.	N. P.	1892
Fairchild, D. S., Ames, Ia.	Div. Surg. C. & N. W.	1888
Firestone, W. W., Wooster, O.	Div. Surg. Penna.	1888
Folks, F. C., Waycross, Ga.	S. F. & W.	1888
Ford, J. H., Wabash, Ind.	Chief Surg. C. W. & M.	1888
Field, J. T., 314 Main St., Fort Worth, Tex.	Chief Surg. Ft. W. & R. G.	1889
Franklin, J. A., Cameron, Mo.	H. & St. Joe.	1889
Finney, John, Clintonville, Wis.	M. L. S. & W.	1889
Fortner, B. F., Vinita, Ind. Ter.	M. K. & T.	1889
Fulton, John F., St. Paul, Minn.	St. P. M. & O.	1889
Farrar, Wm. H., De Soto, Mo.	St. L. I M. & S.	1890
Fernandez. J. D., Jacksonville, Fla.	S. F. & W.	1890
Fry, Chas. B., Mattoon, Ill.	C. C. C. & St. L.	1890
Flexer, L. A., Tamanend, Pa.	L. V.	1891
Free, Spencer M., Du Bois, Pa.	Chief Surg. M. V. R. R.	1891
Fullilove, T. W., Vaiden, Miss.	I. C.	1891
Fisher, Oliver, Custer City, S. D.	Past Asst. Surg. B. & M. R.	1891
Fisher, C. R. P., Bound Brook, N. J.	L. V.	1891
Fitzgerald, Frank, Morrison, Ill.	C. & N. W.	1891
Fanning, Fred W., Butler, De Kalb Co., Ill.	Wab.	1891
Ford, L. C., Lima, Mont.	Asst. Surg. U. P.	1891
Field, Julian C., Denison, Tex.	H. & T. C. and D. & W.	1891
Flick, D. W., Rapid City, S D.	F. E. & M. V.	1891
Ford, De Saussure, Augusta, Ga.	Chief Surg. G. R. R. Co.	1891
Fegers, C. H., McHenry, Ill.	N. W.	1891
Fitzgerald, O. D., Los Angeles, Cal.	Ex-Chief Surg. S. C.	1891
Few, C., Hendersonville, N. C.	R. & D.	1891
Fox, William, 470 Jackson St., Milwaukee, Wis.	Dist. Surg C. & N. W.	1891
Felch, Theo. A., 304 W. Euclid Ave., Ishpeming, Mich.	D. S. S. & A.	1891
Findley, Wm. M., 802 Twelfth St., Altoona, Pa.	A. C. & N.	1891
Furlong, M., 303 Main St., Whitewater, Wis.	C. M. & St. P.	1891
Fitts, W. L., Carrollton, Ga.	C. R. R. of Ga.	1891
Fenelon, John H., Norman, Okla. Ter.	A. T. & S. F.	1892
Fite, F. B., Muskogee, Ind. Ter.	M. K. & T.	1892
Fox, A. L., 109 W. Worth St., Danville, Ill.	C. & E. I.	1892
Field. Matthew D., 71 Broadway, Room 78, New York City, N. Y.	Manhattan Ry. Co.	1892
Freel, S. L., Stouffville, Ontario, Can.	G. T.	1892
Ford, J. W., Talcott, W. Va.	C. & O.	1892
Floyd, J. C. M., 231 N. Fifth St., Steubenville, O.	P. C. C. & St. L. and W. & L. E.	1892
Grinstead, W. T., Cairo, Ill.	St. L. & S. W.	1888
Green, J. H., 481 Locust St., Dubuque, Ia.	C. St. P. & K. C.	1888
Gafford, C. C., Wymore, Neb.	Div. Surg. B. & M. R.	1888
Gerrish, A. A., Lowell, Ind.	L. N. A. & C.	1888
Gumaer, A. G., 802 Bailey Ave., Buffalo, N. Y.	L. S. & M. S.	1888
Graves, James F., Montgomery City, Mo.	Wab.	1888
Griffith, J. D., Rialto Building, Kansas City, Mo.	Con. Surg. K. C. M. & S.	1888
Gilcreest, J. E., 511, Denton St., Gainesville, Tex.	M. K. & T.	1889
Goods, Rhett, Mobile, Ala.	M. & O. and L. & N.	1889
Gooden, W. F., Aurora, Neb.	B. & M.	1859
Graham, J. F., Malvern, Ark.	St. L. I. M. & S.	1890
Galbraith, W. J., Omaha, Neb.	Chief Surg. U. P.	1890
Griswold, L. S. Big Rapids, Mich.	G. R. & I. and C. & W. M.	1890
Gilbert, J. L., Kendalville, Ind.	Div. Surg. G. R. & I.	1890
Golden, L. A., Cedarville, Kan.	Mo. Pac.	1890
Graves, A. C., Cherokee, Kan.	K. C. Ft. S. & M.	1890
Grubbs, O. W., Harrison, O.,	Past Surg. B. F. & F. W.	1890
Gillard, David, Port Clinton, O.	L. S. & M. S.	1891
Greene, Geo. H., Marshall, Mich.	C. J. & M.	1891
Garber, T. W., Muskegon, Mich.	Div. Surg. C. & W. M.	1891

NAME.	NAME OF RAILROAD.	DATE OF MEMBERSHIP.
Gildner, David, Rockwood, Pa.	B. & O.	1891
Glasgow, S. H., Welland P. O., Ont. Can.	Dist. Surg. G. T.	1891
Govan, Wm., Stony Point, N. Y.	Con. Surg. W. & S.	1891
Griswold, Elisha, 359 State St., Sharon, Pa.	N. Y. P. & O.	1891
Guthrie, W. E., Bloomington, Ill.	Dist. Surg. L. E. & W.	1891
Gates, M. A., Ronceverte, W. Va.	C. & O.	1891
Groves, J. E., Uhrichsville. O.	C. L. & W.	1891
Goble, Ezra T., Earlville, Ill.	C. & N. W.	1891
Godfrey, Henry T., Galena, Ill.	Div. Surg. I. C. and C. & N. W.	1891
Gibbon, Robt., Charlotte, N. C.	R. & D.	1891
Green, W. N., Webster City, Ia.	C. & N. W.	1891
Gibbs, D. C., Crawford, Neb.	F. E. & M. V.	1891
Graves, Amos, San Antonio, Tex.	Chief Surg. S. P.	1891
Gaston, Jas. B., Metropolitan, Mich.	C. & N. W.	1891
Geyer, Joseph L., Norwich, O.	B. & O.	1891
Grinnell, A. P., 272 Main St., Burlington, Vt.	Chief Surg. C. V.	1891
Graves, C., Aitkin, Minn.	N. P.	1891
Garwood, A., New Braunfels, Tex.	I. & G. N.	1891
Galligher, B. H., Fordyce, Ark.	St. L, S. W.	1891
Griswold, Joseph B., 103 Ottawa St., Grand Rapids, Mich.	Asst. Surg. G. R. & I.	1891
Geisendorfer, J. S., Arlington, Ore.	U. P.	1891
Gillingham, W. P., Almy, Wyo.	Asst. Surg. U. P.	1891
Grim, Adam, Franklin Grove, Ill.	C. & N. W.	1891
Goddard, Chas. W., Harvard, McHenry Co., Ill.	C. & N. W.	1891
Glaze, L. Alonza, Poseyville, Ind.	E. & T. H.	1891
Grayson, T. F., Ft. Dodge, Ia.	M. C. and Ft. & D.	1891
Gregory, F. J., Keysville, Va.	R. & D.	1891
Green, Edgar M., Easton, Pa.	L. V.	1891
Graham, S., Butler, Pa.	P. & W.	1891
Gillen, R. H., DeLand, Fla.	J. T. & K. W.	1892
Gemmill, J. M., Jr., 305 Logan Ave., Tyrone, Pa.	Penna.	1892
Gafford, J. A., Buena Vista, Colo.	D. & R. G.	1892
Gregory, C. L., Yreka, Cal.	S. P.	1892
Gloninger, Andrew B., Lebanon, Pa.	C. & L.	1892
Gunn, Wm., Clinton, Ontario, Can.	G. T.	1892
Gordon, Geo. G., Flushing. Mich.	C. S. & M.	1892
Grossmann, Paul, 122 S. Seventeenth St., Omaha, Neb.	U. P.	1892
Garlington, T. R., Rome, Ga.	E. T. V. & G.	1892
Gama, Enrique Jurado j, Hospital Militar, Guadalajara, Jalisco, Mex.	Asst. Surg. Central Mexicano.	1892
Gorrell, J. R., Newton, Ia.	C. R. I. & P.	1892
Gardner, James B., Girard, Kan.	A. T. & S. F.	1892
Goodfellow, Geo., Tuscan, Ariz.	S. P.	1892
Graham, W. B., Noblesville, Ind.	L. E. & W.	1892
Gaver, Wm. E., Mt, Airy, Md.	B. & O.	1892
Good, S. S., Myersdale, Pa.	B. & O.	1892
Graves, Geo., Herkimer, N. Y.	Chief Surg. A. & St. L.	1892
Gibson, W. E., Olney. Wash.	S. L. S. & E. R. R of N. P. R. R.	1892
Hovey, B. L., 34 N. Fitsburgh St., Rochester, N. Y.	B. R. & P.	1888
Hearne, J. C., San Diego, Cal.	Ex-Chief Surg. H. & St. J.	1888
Holliday, W. S., Monmouth, Ill.	I. C.	1888
Higgins, C. B., Peru, Ind.	Asst. Chief Surg. Wab.	1888
Hostetler, W. B., Decatur, Ill.	Con. Surg. Wab.	1888
Hollenbeck, A. G., Willow Springs, Mo.	Div. Surg. K. C. F. S. & M.	1888
Henderson, A. G., Imboden, Ark.	K. C. Ft. S. & M.	1888
Huselton, W. S., 17 Hockton Ave., Alleghany, Pa.	Med. Director P. & W.	1888
Hardy, Neal, Massillon, O.	P. F. W. & C.	1888
Hall, J. E., Weeping Water, Neb.	Mo. Pac.	1889
Hawley, J. E., Burr Oak, Kan.	Mo. Pac.	1889
Haire, R. D., Schell City, Mo.	M. K. & T.	1889
Howard, Hartwell C., Champaign Ill.	Wabash	1889
Hobbs, N. R., Elmwood, Neb.	Mo. Pac.	1889
Hungate, Jas. B., Weeping Water, Neb.	Mo. Pac.	1889
Hudson, M. F., Osborne, Kan.	Mo. Pac.	1889
Hughes, Wm. C., Cleaves, O.	C. C. C. & St. L.	1890
Hamilton, J. M., Verona, Pa.	Div. Surg. Allegheny Valley.	1890
Holmes, A. M., 630 Sixteenth St., Denver, Colo.	C. R. I. & P.	1890
Haden, J. T., Crawfordsville, Ark.	St. L. I. M. & S.	1890
Haley, Oba, Fredrickstown, Mo.	St. L. I. M. & S.	1890
Hall, W. C., Coffeyville, Kan.	Mo. Pac.	1890
Hileman, Salem, Sharon, Pa.	L. S. M. S.	1890
Henry, W. C., Aurora, Ind.	O. & M.	1890
Highsmith, G. R., Carrollton, Mo.	Wab. and A. T. & S. F.	1890
Homes, Louis O., Marceline, Mo.	A. T. & S. F.	1890
Hobsom, J. F., 429 Prospect St., Cleveland, O.	Chief Surg. Valley.	1890
Hoege, G. L., Fostoria, O.	N. Y. C. & St. L.	1890
Humfreville, D. W., Waterville, Kan.	M. P.	1890
Harris, R. L., Oakland, Fla.	Chief Surg. O. B.	1890
Holcomb, C. B., Corning, O.	T. & O. C.	1891
Hall, Geo. N., Binghamton, N. Y.	N. Y. L. E. & W.	1891

NAME.	NAME OF RAILROAD.	DATE OF MEMBERSHIP.
Hamilton, S. S., Punkautawney, Pa.	B. R. & P.	1891
Henkel, A. M., Staunton, Va.	C. & O.	1891
Hughart, J. P., Sewell Depot, W. Va.	C. & O.	1891
Hawley, W. H., Penn Yan, N. Y.	N. C.	1891
Hanger, Cornelius, Clarence, Mo.	H. & St. J.	1891
Hunt, J. H., Port Jervis, N. Y.	Con. Surg. N. Y. L. E. & W.	1891
Hall, A. L., Fair Haven, N. Y.	L. V. R. R. Co.	1891
Hulett, J. B., Middletown, N. Y.	N. Y. O. & W.	1891
Hunt, Jas. G., Utica, N. Y.	N. Y. O. & W.	1891
Hutton, Wm., Elizabeth, Ill.	C. St. P. & K. C.	1891
Hays, John W., Albion, Ind.	B. & O.	1891
Harvey, C. C., Dundee, N. Y.	F. B. & C.	1891
Hamilton, S. N., Connersville, Ind.	C. H. & D.	1891
Hall, Josiah N., Sterling, Colo.	Asst. Surg. U. P.	1891
Hoover, Thos. C , 249 E. State St., Columbus, O.	P. C. C. & St. L.	1891
Hepler, B. F., Fort Scott, Kan.	M. P. and M. K. & T.	1891
Hubbard, C. M., Virginia, Ill.	O. & M.	1891
Hobart, A. J., Clinton, Ia.	Dist. Surg. C. & N. W.	1891
Hoering, G. P., Walnut, Ia.	C. R. I. & P.	1891
Harrison, Geo. W., Ashland, Wis.	W. C.	1891
Horn, T. G., Colorado Springs, Colo.	Asst. Local Surg. U. P.	1891
Hanawalt, Geo. P., Des Moines, Ia.	Ex-Chief Surg. D. M. & N. W.	1891
Hayes, Noah, Seneca, Kan.	U. P. and St. J. & G. I.	1891
Hedrick, J. S., Dunkirk, O.	T. C. & C.	1891
Higbee, E. H., Roodhouse, Ill.	C. & A.	1891
Hundley, J. H., Olney, Ill.	O. & M.	1891
Hixson, Manford M., Dupont, O.	T. St. L. & K. C.	1891
Harison, Beverly D., Sault de Ste. Marie, Mich	D. S. S. & A.	1891
Hammer, Robt. B., Greensburg, Pa.	Penna.	1891
Hollister, W. L., Austin, Minn.	C. St. P. & K. C.	1891
Hollenbeck, B. W., Westville, Ind.	B. & O.	1891
Hawes, Jesse, Greeley, Colo.	U. P.	1891
Hume, Arthur M., 123 E. Exchange St., Owasso, Mich.	Asst. Surg. T. A. A. & N. M.	1891
Howes, D. L., South Lyon, Mich.	G. T.	1891
Hildreth, M. L., Lyons, Neb.	C. St. P. M. & O.	1891
Hume, Wm. C., Corinne, Mich.	D. & M.	1891
Hackett, C. J., Le Mars, Ia.	C. St. P. M. & O.	1891
Hobsom, J. A., Flushing, O.	C. L. & W.	1891
Howard, G. R., Marshall, Tex.	House Surg. T. & P.	1891
Hazen, J. M., North Sewichley, Pa..	P. & W.	1891
Howes, J. R., 202 Palladio Bldg., Duluth, Minn.	D. & W.	1891
Hall, C. Lester, Rialto Bldg., Kansas City, Mo.	Cons. Surg. M. P.	1891
Hauss, Augustus P., 236 E. Market St., New Albany, Ind.	P. C. C. & St. L.	1891
Humbert, G. C., Keithsburg, Ill.	I. C.	1891
Hughes, C. H., 500 N. Jefferson St., St. Louis, Mo.	Cons. Surg. M. P.	1891
Hall, John R., Marshall, Mo.	M. P.	1891
Hoge. Wilmer B., Grand Island, Neb.	Asst. Surg. U. P.	1891
Hall, Thos. H., Alma, Kan.	C. R. I. & P.	1891
Henderson, T. R., Greenwood, Miss.	R. & D.	1891
Holton, Wm. M., New Harmony, Ind.	P. D. & E.	1891
Hayes, C. A., Chippewa Falls, Wis.	W. C	1891
Haner, T. D., Keithsburg, Ill.	Past Surg. B. C. R. & N.	1891
Huff, J. W., Onawa, Ia.	S. C. & P.	1891
Hewett, S. R., Charles City, Ia.	C. M. & St. P.	1892
Harriss, J. L., Webster, S. D.	C. M. & St. P.	1892
Henry, Chas. W., Coon Rapids, Ia.	C. M. & St. P.	1892
Henderson, Robert T., Jackson, Mo.	St. L. I. M. & S.	1892
Heddens, Jas. Weir, 301 N. 8th St., St. Joseph, Mo.	Mo. Pac.	1892
Hubbert, T. J., Waco, Tex.	H. & T. C.	1892
Horn, H. Y., Coplay, Pa.	L. V.	1892
Houston, E., Stanberry, Mo.	Asst. Surg. O. & St. L.	1892
Hallock, W. E., Juneau, Wis.	C. & N. W.	1892
Haskell, Wm. A., Alton, Ill.	C. C. C. & St. L.	1892
Hall, O. H., Zumbrota, Minn.	C. M. & St. P.	1892
Hall, Willis W., Springfield, O.	Chief Surg. O. S.	1892
Harding, E. H., Hope, Idaho.	N. P.	1832
Hathaway, L. B., Reinbeck, Ia.	B. C. R. & N.	1892
Horne, Wm., Mt. Ayr, Ia.	C. B. & Q.	1892
Heller, H. D,, Hellertown, Pa.	Phila. & Reading.	1892
Heyd, J. M., Nelsonville, O.	C. H. V. & T.	1892
Hermany, Phaon, Mahanoy City, Pa.	L. V.	1892
Hutchins, J. H., Hampton, Ia.	C. & G. W.	1892
Hughes, J. T., Clifton Forge, Va.	C. & O.	1892
Hilliard, Wm. D., Asheville, N. C.	R. & D.	1892
Henkel, H. H., Staunton, Va.	C. & O.	1892
Hayes, E. S., Eau Claire, Wis.	C. St. P. M. & O.	1892
Haptonstall, John P., Stone Cliff, W. Va.	C. & O.	1892
Haynie, Geo. W., Pasco, Wash.	N. P.	1892
Hollister, G. A., 1927 Washington St., Toledo, O.	L. S. & M. S.	1892
Hopkins, Howard H., New Market, Md.	B. & O.	1892

NAME.	NAME OF RAILROAD.	DATE OF MEMBERSHIP.
Harnden, R. S., Waverly, N. Y.	N. Y. L. E. & W.	1892
Horn. J. A., Mauch Chunk, Pa.	L. V.	1892
Herrick, Albert B., Lisbon, N. D.	N. P.	1892
Harvey, Z. T., Council Grove, Kan.	M. P. and M. K. & T.	1892
Hamilton, N. H., Grafton, N. D.	N. P.	1892
Halderman, S. S., Portsmouth, O.	C. P. & V.	1892
Holyoke, Frank, 441 High St., Holyoke, Mass.	Conn. R. R. R.	1892
Harvey, S. N., Neola, Ia.	C. R. I. & P.	1892
Heaney, Alfred G., Corpus Christi, Tex.	Div. Surg. S. A. & A. P.	1892
Isbell, John, Washington, Mo.	Mo. Pac.	1889
Iden, B. F., Manassas, Va.	R. & D.	1891
Ingersoll, L. F , Grand Junction, Colo.	D. & R. G.	1891
Iback, Frederick G., Mauch Chunk, Pa.	L. V.	1891
Inge, James M., Denton, Tex.	M. K. & T.	1891
Inches, Chas., Scribner, Neb.	F. E. & M. V.	1891
Ingram, Wm. T., Murphysboro, Ill.	St. L. A. & T. H.	1892
Izlar, R. P., Ocola, Fla.	J. T. & K. W.	1892
Jackson, J. P., Journal Bldg., Kansas City, Mo.	Wab. St. L. & Pac.	1888
Jenkins, J. W., St. Louis, Mo.	Mo. Pac.	1888
Jackson, A. P., Oakfield, N. Y.	West Shore.	1888
Jenkins, W. O., Terre Haute, Ind.	Big Four.	1888
Jones, J. Luther, Jonesburg, Mo.	Wab.	1889
Johnson, G. K., Grand Rapids, Mich.	Chief Surg. G. R. I.	1889
Jenkins, Chas. W., Williamsville, Mo.	St. L. I. M. & S.	1889
Justice, J. D., 118 5th Ave., Belle Plaine, Kan.	Mo. Pac.	1889
Jones, Geo. Nelson, Burlington, Ia.	C. B. & Q.	1889
Johnson, C. M., St. Charles, Mo.	Wab.	1889
Jones, Herbert G., 240 Genesee St., Utica, N. Y.	Div. Surg. West Shore.	1890
Jenner, Elisha, West Salem, Ill.	P. D. & E.	1890
Jeannotte, J. A., Clyde, Kan.	Cen. Branch. Mo.Pac.	1890
Jenkins, E. R , Washington, Ia.	C. R. I. & P.	1891
Janss, John, Grand Island, Neb.	Asst. Surg. B. & M. R.	1891
Jay, Milton, 70 State St., Chicago, Ill.	Chief Surg. C. &. E. I.	1891
Jacobs, L. D., 503 Union St., Emporia, Kan.	A. T. & S. F.	1891
Jackson, W. H., Springville, N. Y.	B. R. & P.	1891
Johnson, Abijah, Montrose, Colo.	D. & R. G.	1891
Jones, David Newton, Gaylord, Minn.	Div. Surg. M. &. St. L.	1891
Johnson, T. H., 245 E. 7th St., St. Paul, Minn.	N. P.	1891
Jonas, A. F., 317 & 318 Continental Block, Omaha, Neb.	F. E. & M. V.	1891
Jones, A. B., Wa Keeney, Kan.	Asst. Surg. U. P.	1891
Jackson, Jabez N., Journal Bldg., Kansas City, Mo.	Wab.	1891
Johnson, N., Powellton, W. Va.	Chief Surg. P. & P.	1891
Johnston, C. H., Austin, Minn.	C. St. P. & M.	1891
Johnson, C. H., Austin, Minn.	C. M. & St. P.	1892
Jacques, Wm., Jarvis, Ontario, Can.	G. T.	1892
Jolly, Arnold, Birmingham, Ala.,	E. T. V. & G.	1892
Jennings, C. A., Salesburg, Mo.	Wabash.	1892
Jackson, W. R., Seymour, Mo.	K. C. F. S. &. M.	1892
Johnson, T. B., Adamstown, Md.	B. & O.	1892
Johnson, Wm. E., 440 Park Ave , Waverly, N. Y.	N. Y. L. E. & W. and L. V.	1892
Johnston, W. M., Williams, Ariz.	A. & P.	1892
Johnson, George W., Savanna, Ill.	C. M. & St. P.	1892
Jenner, A. E., 1913 E. 3rd St., Dayton, Ohio.	N. Y. P. & O.	1892
Jones, Thos. H., Jonesboro, Ark.	St. L. S. W.	1892
Klingensmith, I. P., Blairsville, Pa.	Penna. R. P.	1888
King, W. P., Kansas City, Mo.	Asst. Chief Surg. M. P.	1888
Knott, S. J., Crawfordsville, Ark.	I. M. & S.	1889
Keller, Lester, Ironton, O.	Dist. Surg. C. & O.	1889
Knox, M. D., Hillsboro, Tex.	M. K. & T.	1889
Koogler, Marion A., El Dorado, Kan.	Mo. Pac.	1889
Kaster, J. P., 118 Railroad Ave., Albuquerque, N. M.	Chief Surg. A. & P.	1890
King, Clarence, Machias, N. Y.	B. R. & P.	1891
Keene, L. S., Laporte, Ind.	L. S. & M. S.	1891
Kneeland, C. J., Traverse City, Mich.	Div. Surg. C. & W. M.	1891
Kelley, Webb J., Galion, O.	Big Four.	1891
King C. F., Hudson, Wis.	C. St. P. M. & O.	1891
Kauffman, Jacob S., Blue Island, Ill.	C. R. I. & P.	1891
Knapp, A. R., Leoti, Kan.	M. P.	1891
King, Elmore Y., Richwood, O.	N. Y. P. & O.	1891
Kenyon, David Lee, Worthington, Minn.	C. St. P. M. & O.	1891
Kimbrough, Geo. R., Emory, Tex.	M. K. & T.	1891
Kirschner, P. J., 310 Felix St., St. Joseph, Mo.	C. R. I. & P.	1891
Kean, Norman L., Northwood, Ia.	B. C. R. & N.	1891
Kearns, A. J., Loup City, Neb.	B. & M. R.	1891
Kimball, C. B., West Liberty, Ia.	C. R. I. & P.	1891
Kerr, A. F., Millboro Depot, Va.	C. & O.	1891
Kelley, John H., Parkersburg, W. Va.	B. & O.	1891
Kaull, Wm. M., Watertown, S. D.	B. C. R. & N.	1891
Kelley, H. R., Galion, O.	Con. Surg. Erie.	1891
Kennedy, F. C., Shelbyville, Ind.	C. C. C. & St. L.	1891

NAME.	NAME OF RAILROAD.	DATE OF MEMBERSHIP.
Kemerer, F. M., Crooksville, O.	C. S. & H.	1891
Knight, Samuel S., Fountain Inn, S. C.	G. & L.	1891
Knox, A. W., 516 Blount St., Raleigh, N. C.	Chief Surg. S. A. L.	1891
Kalb, Geo. B., Jeddo, Pa.	L. V.	1892
Keppel, John W., Old Fort, O.	N. Y. C. & St. L.	1892
Keylor, Howard R., Walla Walla, Wash.	Chief Surg. W. & C. R.	1892
Kesner, C. C., Le Roy, Kan	Mo. Pac.	1892
Kirkpatrick, C., Adrian, Mich.	L. S. & M. S.	1892
Kibler, C. B., Corry, Pa.	N. Y. P. & O.	1892
Kimmell, H. S.. Somerset, Pa.	B. & O.	1892
Keller, Bayard T., Bloomingburg, O.	B. & O.	1892
King, Geo. W., Marysville, Mont.	N. P.	1892
King, J. C. J., Waco, Tex.	M. K. & T.	1892
Keefe, Thomas, Snohomish, Wash.	N. P.	1892
Kane, W. W., Coultersville, Ill.	St. L. A. & T. H.	1892
Kutnewsky, J. R., Redfield, S. D.	C. & N. W.	1892
Kyle, John J., Aurora, Ind.	C. C. C. & St. L.	1892
Kemper, G. W. H., 112 W. Adams St., Muncie, Ind.	L. E. & W.	1892
Livingston, T. P., 622 Main St., Plattsmouth, Neb.	Chief Surg. B. & M. R.	1888
Lewis, J. R., Grinnell, Ia.	Central Iowa.	1888
Linvill, D. G., Columbia City, Ind.	Wabash West.	1888
Lee. E. W.. Chicago, Ill.	P. R. R.	1888
Lewis, E. R., Kansas City, Mo.	Wabash West.	1888
Lawrence, W. B., Batesville, Ark.	S. L. I. M. & S. White Riv. Br.	1888
Lutz, Frank J., 1805 Broadway, St. Louis, Mo.	Chief Surg. St. L. & S. F.	1889
Lanphear, S. Emery, 1309 E. 8th St., Kansas City, Mo.	Wab.	1889
Lynn, Wm. H., Hastings, Neb.	M. P.	1889
Love, Frank S., Belle Plaine, Kan.	M. P.	1889
Linville, Montgomery, New Castle, Pa.	E & P.	1889
Lower, M. O., North Manchester, Ind.	Wabash	1890
Lears, J. L., Chadron, Neb.	F. E. & M. V.	1890
Lightner, S. B., Sabina, O.	Comp. Surg. C. & C. M.	1890
Lindsay, Thos., Garnett, Kan.	A. T. & S. F.	1890
Lusk, Z. J., Warsaw, N. Y.	B. R. & P.	1891
Leavitt, B. C., 726 14th St., Denver, Colo.	D. & R. G.	1891
Landrum, J. B. O., Landrum, S. C.	A. & S.	1891
Longshore, W. R., Hazleton, Pa.	L. V.	1891
Lutterloth, C. M., Jonesboro, Ark.	K. C. F. S. & M.	1891
Lyman, H. H., Fillmore, N. Y.	W. N. Y. & P.	1891
Lipscomb, C., Denton, Tex.	M. K. & T.	1891
LeBlond, J. B., Sioux Falls, S. D.	St. P. M. & M. and G. N.	1891
Lacey, Thos. B., 540 6th Ave., Council Bluffs, Ia.	C. & N. W.	1891
Lyman, Chas. B., 1517 Stout St., Denver, Colo.	Asst. Div. Surg. U. P.	1891
Lane, Wm. H., Miller, S. D.	C. & N. W.	1891
Leech, Louis J., West Branch, Ia.	B. C. R. & N.	1891
LeFevre, Edwin, Sidney, O.	C. H. & D.	1891
Lee, E. A., Fort Collins, Colo.	U. P.	1891
Logan, Hugh, The Dalles, Ore.	Asst. Surg. U. P.	1891
Leisenring, Henry G., Wayne, Neb.	C. St. P. M. & O.	1891
Lewis, E. C., Penfield, Pa	A. V.	1891
Leach, Sherman, Mt. Sterling, O.	B. & O.	1891
Lewis, Bransford, St Louis, Mo.	Con. Surg. M. P.	1891
Lukens, C. J., Oskaloosa, Ia.	I. C. (Oculist and Aurist.)	1891
Loeb, H. W., 303 N. Grand Ave., St. Louis, Mo.	M. P. (Con. Laryngologist.)	1891
Ladd, J. A., Traer, Tama Co., Ia.	B. C. R. & N.	1891
Latham, P. H.. Weatherby, Pa.	L. V.	1891
Linvill, D. S., Columbia City, Ind.	Wab.	1891
Letcher, James H., 341 Center St., Henderson, Ky.	L. & N.	1891
Lawrence, Jas. C. H., Oconto, Wis.	Mil. Northern.	1892
Lynch, D. W., West Bend, Wis.	C. & N. W.	1892
Lammers, F. H., Greencastle, Ind.	C. C. C. & St. L.	1892
Lockwood, T. P., Crystal Springs, Miss.	Ill. Cent.	1892
Lamb, W. W., 1249 Hanover St., Philadelphia, Pa.	Dist. Accd. Penna.	1892
Leyman, Emery H., Huntington, Ind.	Div. Surg. C. & E.	1892
Lundy, John B., Preston, Ontario, Can.	G. T. of Can.	1892
Loring, S. C., Burr Oak, Ind.	N. Y. C. & St. L.	1892
Legare, J. Cecil, Donaldsonville, La.	T. & P.	1892
Lee, Edward W., 315 S. Fifteenth St., Omaha, Neb.	B. & M. R.	1892
La Count, D., 612 Grant St., Wausau, Wis.	M. L. S. & W.	1892
Myers, S. N., Martinsburg, W. Va.	B. & O.	1888
McCollum, E. J., Tiffin, O.	T. W. O. and B. & O.	1888
Martin, J. H., Greenville, Pa.	Chief Surg. P. S. & L. E.	1888
McArthur, Daniel S., LaCrosse, Wis.	C. B. & N.	1888
Marks, Solon, Milwaukee, Wis.	Chief Surg. C. M. & St. P.	1888
Murphy, J. H., 516 Jackson St., St. Paul, Minn.	Gen. Surg. C. St. P. M. & O. and Chief Surg. G. N.	1888
Mackie, Wm., 107 Wisconsin St., Milwaukee, Wis.	C. M. & St. P.	1888
Murdoch, J. B., Pittsburgh, Pa.	Chief Surg. P. C. C. & St. L.	1888
Middelkamp, H. A., Warrenton, Mo.	Wab. West.	1888
McHatton, H., Macon, Ga.	Div. Surg. E. T. V. & G.	1888

NAME.	NAME OF RAILROAD.	DATE OF MEMBERSHIP.
Mooney, H. C., Laketon, Ind.	C & A. and Wab.	1888
Morton, D. K., Missouri City, Mo.	Wab.	1888
McCurdy, S. L., Dennison, O.	P. C. C. & St. L.	1888
Myers, C. W., Clinton, Ia.	C. N. & St. P.	1888
Miller, D. P., Huntingdon, Pa.	Chief Surg. H. & B. T. M.	1888
Murray, L. F., Holden, Mo.	M. P.	1889
Moore, Wm. A., 220 Wash. St., Binghamton, N. Y.	D. L. & W.	1889
Moore, A. B., Gurdon, Ark.	St. L. I. M. & S.	1889
Mudd, J. R., St. Charles, Mo.	Wab.	1889
Mullen, Jr., Alex. J., Michigan City, Ind.	Div. Surg. M. C.	1889
Mansfelde, Alex. S. V., Ashland, Neb.	Asst. Surg. B. & M. R.	1889
Murray, T. J., Butte, Mont.	U. P. and Chief Surg. M. U.	1889
Mitchell, J. W., Superior, Neb.	M. V.	1889
Mendenhall, R. G., La Cygne, Kan.	K. C. Ft. S. & M.	1889
Mahon, W. T., Chamois, Mo.	M. P.	1889
Maggie, W. H., Duluth, Minn.	U. P. and Chief Surg. St.P. & D.	1889
Maclin, W. T., Du Quoin, Ill.	St. L. & C.	1889
McMahon, R. W., 214 Jersey St., Quincy, Ill.	W. St. L. & P.	1889
McCandless, W. L., Pinckneyville, Ill.	St. L. A. & T. H.	1889
McNeill. M. J., Olive Branch, Miss.	K. C. M. & P.	1889
McCoy, P. Y., Evansville, Ind.	Div. Surg. L. & N.	1889
McKlveen, J. A., Chariton, Ia.	C. B. & Q.	1889
McCulley, W. A., Independence, Kan.	M. P.	1889
Merz, Chas. H., Sandusky, Ohio.	L. S. & M. S.	1889
Miller, E. J., Marion, S. D.	C M. & St. P.	1889
Mussey, W. L., Cincinnati, Ohio.	Chief Surg. O. & M.	1890
Martin, Z. T., Lathrop, Mo.	H. & St. J. and S. Fé.	1890
Maclay, A. I., Delavan, Ill.	P. D. & E.	1890
Mitchell, Sollace, Jacksonville, Fla.	Chief Surg. J. & K. W.	1890
Miller, C. W., Doniphan, Mo.	St. L. I. M. & S.	1890
McConaughy, Robert, York, Neb.	F. E. & M. V.	1890
McKee, James, 128 N. Blount St., Raleigh, N. C.	N. C. Div. R. & D.	1890
McLeod, John A., Ironwood, Mich.	M. L. S. & W.	1890
McJunkin, John, Toccoa, Ga.	R. & D.	1890
McIntyre, C. W., 250 Vincennes St., New Albany, Ind.	O. & M.	1890
McLean, W. F., Elyria, Ohio.	L. S & M. S.	1891
McComas, H. W., Oakland, Md.	B. & O.	1891
McComas, J. Lee, Oakland, Md.	B. & O.	1891
Mattice, M. B., Sedro, Wash.	S. L S. & E. Branch of U. P.	1891
Mahon, J. B., Pittston, Pa.	L. V.	1891
Martin, Chas. M., Sunbury, Pa.	P. R. R.	1891
Moutmollin, J. M., Ashland, Ky.	Chief Surg. A. C. & I.	1891
Moore, E. O., Helena, Ark.	L. N. O. & T.	1891
McKnight, H. P., Long Pine, Neb.	F. E. & M. V.	1891
McKnight, E. J., East Hartford Conn.	N. Y. & N. E.	1891
Myers, Wm. H., Myersdale, Pa.	B. & O.	1891
Mountain, W. S., Confluence, Pa.	B. & O.	1891
McCulloch, T. C., 220 Center St., Oil City, Pa.	W. N. Y. & Pa.	1891
Morrow, Wm. B., Walton, N. Y.	N. Y. O. & W.	1891
Mattoon, E. A., Salida, Colo.	D. & R. G.	1891
MacLean, Donal, 72 La Fayette Ave., Detroit, Mich.	Chief Surg. M. C. and G. T.	1891
Morgan, Chas. F., Greenville, Mich.	Div. Surg. D. L. & N.	1891
Markwith, A. F., Greenville, O.	C. J. & M.	1891
Moody, Geo. W., Huron, S. D.	Div. Surg. C. & N. W.	1891
Massey, Columbus V., Athens, Ill.	J. S. E. L.	1891
McLaughlin, A. W., 9038 Houston Ave., So. Chicago, Ill.	B. & O.	1891
Mayo, W. J., Rochester, Minn.	C. & N. W.	1891
Marbourg, E. M., Pueblo, Colo.	D. & R. G. (Oculist and Aurist.)	1891
McLean, John, Pullman, Ill.	Chief Surg. P. P. C. Co.	1891
Mosby, Wm. L., Bardwell, Ky.	Ill. Cent.	1891
Monday, W. H., Terrell, Tex.	T. & P.	1891
McFarland, A. F., Gallatin, Mo.	C. R. I. & P.	1891
McCallister, Wm. A., Centralia. Mo.	Wabash	1891
McCallum, Wm., Gladstone, Mich.	M. St. P. & S. Ste. M.	1891
Moss, Nat. P., La Fayette, La.	S. P.	1891
Miller, John A., Rockland, N. Y.	N. Y. O. & W.	1891
Morris, Elliston J., 128 S. 18th St., Philadelphia, Pa.	B. & O.	1891
Maynard, H. J., 706 18th East, Cheyenne, Wyo.	Asst. Surg. U. P.	1891
Miller, David W., Gilman, Ill.	I. C.	1891
McKay, Wm. T., Arkansas City, Kan.	M. P.	1891
McCleery, T. C., Exeter, Neb.	F. E. & M. V.	1891
McPeck, E. E., Bowerston, O.	W. & L. E.	1891
McCleare, J. D., Indianola, Ia.	C. R. I. & P.	1891
More, Chas. W., Ely, Minn.	D. & I. R.	1891
Morton, John H., La Veta, Colo.	D. & R. G.	1891
McCarty, T. L., Dodge City, Kan.	A. T. & S. F.	1891
McVey, J. D., Lake City, Ia.	Dist. Surg. C. & N. W.	1891
Mitcalf, A. A., Crystal Falls, Mich.	C. & N. W.	1891
Minor, James L., Memphis, Tenn.	K. C. M. & B. (Oculist.)	1891
Mann, Eugene L., St. Paul, Minn.	N. P.	1891

NAME.	NAME OF RAILROAD.	DATE OF MEMBERSHIP.
McOscar, E. J., Fort Wayne, Ind.	G. R. & I.	1891
Middleton, Wm. D., Davenport, Ia.	Chief Surg. C. R. I. & P.	1891
Marcellus, T. M., Sleepy Eye, Minn.	C. & N. W.	1891
Merchant, M. F., Ellendale, N. D.	C. M. & St. P.	1891
McMullen, B. H., Cadillac, Mich.	Asst. Chief Surg. T.A.A. & N.M.	1891
Main, John T., 143 W. Main St., Jackson, Mich.	G. T.	1891
McIlnenny, Robt. A., Conway Springs, Kan.	M. P.	1891
Maurer, A. A., 231 Main St., LaCrosse, Wis.	C. & N. W.	1891
Mason, John P., Houghton, Mich.	D. S. S. & A.	1891
Medbery, J. N., Webster City, Ia.	Chief Surg. C. C. R. R. C.	1891
Mailer, A. Caldwell, De Pere, Wis.	C. M. & St. P.	1891
McDonald, A. J., Bedford, Ind.	E. & R.	1891
Morriss, S. J., Atlanta, Tex.	T. & P.	1891
Manning, John M., Durham, N. C.	R. & D.	1891
McDavitt, T., Cor. 4th and Wabasha, St. Paul, Minn.	C. M. & St. P. (Oculist.)	1891
McIntosh, James, Newberry, S. C.	R. & D.	1891
Martin, Harry H., Ashland, Ky.	Asst. Chief Surg. A. C. & I.	1891
Mayer, Edward, Du Quoin, Ill.	I. C.	1891
Merrill, Burton J., Stillwater, Minn.	C. St. P. M. & O.	1891
Murphy, J. B., 36 Washington St., Chicago. Ill.	N. P. and W. C.	1891
Mears, John, 411 Poplar Ave., Kansas City, Mo.	Chief Surg. K. C. O. & S.	1891
Milner, Thos. J., 707 W. Lee St., Greenville. Tex.	M. K. & T.	1892
McLean, J. W., Fayette, Ia.	C. M. & St. P.	1892
Martiner, Eustolio M., Victoria, Tamaulipas, Mex.	M. G. M.	1892
Moon, Arnold C., Williamsburgh, Ia.	C. M. & St. P.	1892
McMurtry, Milton, Purcell, Ind. Ter.	A. T. & S. F.	1892
Moll, Lewis, Hanover, Kan.	St. J. & G. I.	1892
McKenzie, J. A., El Dorado, Kan.	A. T. & S. F.	1892
Markham, H. C., Independence, Ia.	I. C.	1892
Myrick, E. B., Estherville, Ia.	B. C. R. & N.	1892
McArthur, J. A., 56 Queen's Ave., Berlin, Ont., Can.	Div. Surg. G. T.	1892
Mason, Frank G., 163 State St., Chicago, Ill.	A. T. & S. F.	1892
Mathews, John O., Howe, Tex.	H. & T. C.	1892
McNutt, H. E., Aberdeen, S. D.	C. & N. W.	1892
McQueston, E. F., Nashua, N. H.	C. & M.	1892
Myers, A. H., 837 E. Main St., Mt. Pleasant, Pa.	B. & O.	1892
Moran, Geo. H., Morganstown, N. C.	R. & D.	1892
Marcy, Alex., Riverton, N. J.	Amboy Div. Penna. Ry.	1892
McGill, Sam'l, Leesburgh, Va,	D. & W.	1892
Marsh, W. Q., Sierra Mojada, Coahuila, Mex.	Chief Surg. Mex. Nor.	1892
Massey, Isaac, West Chester, Pa.	Phila. Div. Penna. R. R.	1892
Miller, Truman W., 1071 N. Clark St., Chicago, Ill.	C. & G. T.	1892
Martin, J. B., Traverse City, Mich.	Div. Surg. M. & N. E.	1892
Manley, Thos. H., 302 W. 53d St., New York City, N.Y.	Cent. Park E. & W.	1892
Mussey, R. D., 159 Elm St., Cincinnati, O.	Chief Surg. C. H. & D.	1892
McCoy, Chas. B., Opelika, Ala.	C. R. R. of Ga.	1892
Myers, John D., Huntington, W. Va.	Dist. Surg. C. & O.	1892
Mulhall, J. C., 3609 Lindell Ave., St. Louis, Mo.	Con. Surg. Wab.	1892
Miller, W. H. F., Clifton Forge, Va.	C. & O.	1892
McKinnon, John A., Selma, Ala.	E. T. V. & G.	1892
Murphy, Walter A., Parkesburg, Pa.	Penna.	1892
Morrison, Geo. A., Columbus, Kan.	K. C. Ft. S. & M.	1892
Maston, Geo. W., Albany, Ore.	Chief Surg. O. P.	1892
Mills, Theodore D., Middletown, N. Y.	N. Y. O. & W.	1892
Minor, H. A., Macon, Miss.	M. & O.	1892
Melvin, W. J., Duffields, W. Va.	B. & O.	1892
McKinley, J. Bates, Harrisburg, O.	B. & O.	1892
Northrop, Geo. J., Marquette, Mich.	Chief Surg. D. S. S. & A.	1888
Nugent, W. R., Oskaloosa, Ia.	Chief Surg. C. I.	1888
Nesbitt, G. W., Sycamore, Ill.	C. & N. W.	1888
Newkirk, A. B., Los Angeles, Cal.	B. & M. R.	1889
Newcomer, M. V. B., Tipton, Ind.	L. E. & W.	1889
Nolan, E. C., Mt. Pulaski, Ill.	P. D. & E. and I. C.	1890
Nye, Wm. W., Hiawatha, Kan.	M. P.	1890
Nickell, G. M., Millboro Depot, Va.	C. & O.	1891
Nash, Geo. A., Marysville, Mo.	O. & St. L.	1891
Nihiser, Winton M., Keedysville, Md.	B. & O.	1891
Nutt, Geo. D., 439 Market St., Williamsport, Pa.	F. B.	1891
Nelson, Hugh, T., 205 E. High St., Charlottesville, Va.	C. & O.	1891
Neeley, E. A., 126 Hernando St., Memphis, Tenn.	Div. Surg. K. C. F. S. & M.	1891
Newcomb, W. K., Fisher, Ill.	I. C.	1891
Newland, Thos. J., Ellensburgh, Wash.	N. P.	1891
Nickolson, Almon W., Newberry, Mich.	D. S. S. & A.	1891
Norin, F. L., Ada, Minn.	N. P.	1891
Nance, W. H., Gunnison, Miss.	L. N. O. & T.	1891
Neisley, C. M., 521 Cherokee St., S. Bethlehem, Pa.	P. & R.	1892
Nott, W. B., Enoree, S. C.	S. & A.	1892
Neale, J. B., Reynoldsville, Pa.	A. V.	1892
Nedry, H. M., Dorchester, Wis.	W. C.	1892
Noland, B. F., Farmwell, Va.	R. & D.	1892

NAME.	NAME OF RAILROAD.	DATE OF MEMBERSHIP.
North, A. C., Newman, Ga.	A. & W. P. and Central R. R.	1892
Outten, W. B , 3603 Lindell Ave., St Louis, Mo.	Chief Surg. M. P.	1888
Osborne, H. B., Kalamazoo, Mich.	L. S. & M. S.	1888
O'Connor, John W.. Denver, Colo.	Chief Surg, Den. & Rio G.	1889
O'Connell, R. S., Cato, Wis.	M. L. S. & W.	1889
Oven, L. P., Brookfield, Mo.	H. & St. J.	1889
Overstreet, W. C., Sedalia, Mo.	M. P and M. K. & T.	1889
Owens, John E., 1806 Michigan Ave., Chicago, Ill.	Chief Surg. C. & N. W.	1889
O'Brien, M. W., Alexandria, Va.	R. & D. and Dist. Surg. C. & O.	1891
Oslin, J. W., Gainesville, Ga.	R. & D.	1891
Owens, Cleon C., Maysville, Ky.	C. & O.	1891
Oettiker, James, Platteville, Wis.	C. & N. W.	1891
Olds, W. H., Sprague, Wash.	N. P.	1891
Olive, James A., Houston, Tex.	G. C. & S. F.	1891
Owings, John H., Deer Lodge, Mont.	Asst. Surg. M. U. and Local Surg. N. P.	1891
O'Connell, J. M., Ponce, Neb.	C. St. P. M. & O.	1891
Oldham, Jas. E., 202 E. Central St., Wichita, Kan.	Con. Surg. A. T. & S. F.	1891
O'Neill, S. E. Ottumwa, Ia.	C. Ft. M. & D.	1892
Oleson, C. W., Lombard, Ill.	C. & N. W.	1892
O'Reilly, Chas., Toronto, Can.	C. P. R.	1892
Packard, N. I., Sturges, Mich.	L. S. & M. S.	1888
Pettijohn, N. J., Kansas City, Mo.	Chief Surg. K. C. Ft. S. & M.	1888
Pattison, I., Oelwein, Ia.	C. St. P. & K., M. & N. W. and B. C. R. & N.	1888
Payne, R H., Richland, Ia.	Div. Surg. I. C.	1888
Peebles, G. H., Lincoln, Neb.	U. P.	1888
Powell, D. F., Thayer, Mo.	Div. Surg. K. C. Ft. S. & M.	1888
Powel, C. B.. Albia, Ia.	W. W. and C. B. & Q.	1888
Pogue, Joseph, Edwardsville, Ill.	Wab. and J. S. E.	1889
Pitman, J., Kirkwood, Mo.	Mo. Pac.	1889
Pritchard, J. F., Manitowoc, Wis.	Chief Surg. M. L. S. & W.	1889
Phillips, Jr.. Wm. Addison, Salina, Kan.	M. P. and C. R. I. & P.	1889
Parker, Joseph, Colfax, Ind.	C. C. C. & St. L.	1890
Payne, J. D., Richland, Ia.	Cen. Ia.	1890
Phelps, Chas. H., St. Mary's, O.	L. E. & W.	1890
Philler, Hugo, Waukesha, Wis.	C. M. & St. P.	1890
Porter, Miles F., Ft. Wayne, Ind.	Wab.	1890
Priest, W. R., Concordia, Kan.	M. P.	1890
Putnam, B. B., Bucklin, Mo.	A. T. & S. F.	1890
Pearman, J. T., Champaign, Ill.	Div. Surg. I. C.	1890
Parke, C. R., 431 Washington Ave., Scranton, Pa.	Med. Ex. N. Y. O. & W.	1891
Pendell, E. J., Marshall, Mich.	Div. Surg. C. & W. M.	1891
Peck, F. H., Clinton, N. Y.	N. Y. O. & W.	1891
Peck, S. P , Hinton, W. Va.	C. & O.	1891
Powell, W. S., Defiance, O.	Wab.	1891
Price, Oscar J., 538 W. Adams St., Chicago, Ill.	C. A. & St. L.	1891
Pritchett, G. L., Fairbury, Neb.	C. R I & P.	1891
Parker, Edward H., Eau Claire, Wis.	W. C.	1891
Phillips, Ellis, New Haven, Pa.	P. & L. E.	1891
Patton, Wm. R., Charleston, Ill.	Local Div. Surg. T. St. L. & K. C.	1891
Phillips, N. D., Gainesville, Fla.	S. F. & W.	1891
Porter, H. R., Bismarck, N. D.	N. P.	1891
Patterson, M. F., Fonda, Ia.	I. C.	1891
Pinkerton, Samuel H., Salt Lake City, Utah.	Visiting Surg. R. G. W.	1891
Purdue, Geo. C., Wichita, Kan.	A. T. & S. F.	1891
Patten, A., Mineola, Tex.	T. & P.	1891
Patterson, Jno. M., Eads, Colo.	M. P.	1891
Peckham, Fenner H., 176 Benefit St., Providence, R. I.	N. Y. P. & B.	1891
Proudfoot, Milton H., Rowlesburg, W. Va.	B. & O.	1891
Payne, Jr., Robert Lee, Lexington, N. C.	R. & D.	1891
Pease, W. C., Cumberland, Wis.	Special Surg. C. St P. M. & O.	1891
Paddock, James A., Deadwood, S. D.	Asst. Surg. B. & M. R.	1891
Page, J. F., Mystic, Ia.	C. M. & St. P.	1891
Potter, I. L., Ackley, Ia.	I. C.	1891
Philpott, C. H., Ottumwa, Ia.	C. B. & Q.	1891
Pilkinington, G. W., Garnett, Kan.	M. P.	1891
Parker, C. B., 564 Euclid Ave., Cleveland, O.	Asst. Surg. Valley.	1891
Phippen, S. S. C., Owosso, Mich.	M. C.	1891
Penhall, Fletcher W., Birch Cooley, Minn.	M. & St. L.	1891
Paine, Henry E., Dixon, Ill.	Dist. Surg. C. & N. W.	1891
Perezde, Yarto R., Botica de Guadalupe, Acambaro Guanajuato, Mex.	Div. Surg. Mex. National Ry.	1892
Potter, J. H., Buffalo, N. Y.	G. T.	1892
Pace, H. L., Tulare, Cal.	S. P.	1892
Peckstein, J. W., Wyaconda, Mo.	A. T. & S. F.	1892
Patterson, P. D., Charlotte, Mich.	C. & G.T.	1892
Port, R. H., Sumas, Wash.	N. P.	1892
Petty, J. M., Wells, Nev.	S. P.	1892
Patchin, F. J., Nelson, Neb.	C. R. I. & P.	1892

NAME.	NAME OF RAILROAD.	DATE OF MEMBERSHIP.
Paine, D. A., Eugene, Ore.	S. P.	1892
Palmer, Henry, Janesville, Wis.	Dist. Surg. C. & N. W.	1892
Price, M. F., Colton, Cal.	S. P.	1892
Plumbe, E O., Rock Valley, Ia.	C. M. & St. P.	1892
Pease, Hiram L., 7530 Greenwood Ave., Chicago, Ill.	N. Y. C. & St. L.	1892
Preston, G. H., Kane, Pa.	Phila. & Erie of Pa.	1892
Plummer, S. C., 709 Twentieth St., Rock Island, Ill.	Chief Surg. C. R. I. & P.	1892
Perkins, Frederick, 895 Elm St., Manchester, N. H.	C. & M.	1892
Peck, R. C., Hinton, W. Va.	C. & O.	1892
Patton, James H., Trenton, Mo.	C. R. I. & P.	1892
Pettit, W. B., New Canton, Va.	C. & O.	1892
Parke, W. T., Listowel, Ontario, Can.	Dist. Surg. G. T. of Can.	1892
Plum, Henry A., Hawley, Pa.	N. Y. L. E. & W.	1892
Philpott, John W., Ft., Madison, Ia.	Chief Surg. C. Ft. M. & Des M.	1892
Perry, Benj. J., Aspen, Colo.	Asst. Surg. C. M.	1892
Quinn, Allen L., Wilmington, O.	C. & C. M. and B. & O.	1890
Quinn, J. A., St. Paul, Minn.	M. & St. P. and S. S. M.	1892
Rogers, W. B., 69 Madison St., Memphis, Tenn.	Chief Surg. K. C. M. & B and L. N. O. & T.	1888
Reed. R. Harvey, Mansfield, O.	Cons. Surg. B. & O.	1888
Russell, L. E., Springfield, O.	Chief Surg. O. S.	1888
Richardson, N. S., Mason, Mo.	Wab. Wes.	1888
Rickey, J. C., Mt. Sterling, Ill.	Wabash	1888
Rice, John T., Attica, Ind.	W. St. L. & P.	1888
Ristine, Henry, Cedar Rapids, Ia.	B. C. R. & N.	1888
Rhu, Auguste, Marion, O.	C. C. C. & St. L.	1888
Reynolds, Ephriam M., Centerville, Ia.	K. & W.	1888
Root, E. F., Salt Lake City, Utah.		1889
Rice, S. M., Terre Haute, Ind.	Chief Surg. Vandalia Line.	1889
Robbins, S. D., Vicksburg, Miss.	Chief Surg. V. & M.	1889
Rainey, Geo. S., Salem, Ill.	O. & M.	1889
Robert, Jas. J., Hillsboro, Tex.	St. L. A. & T.	1889
Robinson, S. E., West Union, Ia.	Div. Surg. C. M. & St. P.	1889
Root, A. D., Crete, Neb.	M. P.	1889
Russell, Jno. E., Mt. Vernon, O.	C. A. & C and B. & O.	1889
Ragsdale, J. E., Gibson City, Ill.	Wabash	1889
Rook, Chas. W., Quincy, Ill.	Asst. Surg. O. B. & I. and St. L. K. & N. W.	1889
Rambo, J. H., Glenwood, Mo.	Wabash	1890
Redmon, S. H., Tipton, Mo.	Mo. Pac.	1890
Robinson, E. M., Bessemer, Ala.	B. M. & B. B.	1890
Robinson, C. E., Clarksville, Ark.	L. R. & Ft. S.	1890
Reynolds, Lawrence, Horton, Kan.	C. R. I. & P.	1890
Ross, Benj. B., Saginaw, Mich.	Chief Surg. T. & P. M.	1891
Rowe, E. W., Orange, Va.	R. & D.	1891
Reber, W. W., Lehighton, Pa.	L. V.	1891
Ritchey, J. A., Oil City, Pa.	N. Y. P. & O.	1891
Riddell, S. S., Chippewa Falls, Wis.	C. St. P. M. & O.	1891
Ross, Geo., Richmond, Va.	Chief Surg. R. & D.	1891
Rood, C. A., Reedsburg, Wis.	C. & N. W.	1891
Rheinfrank, John H., Perrysburg, O.	Div. Surg. C. H. & D.	1891
Ross, J. Frank, Clarion, Pa.	Asst. Chief Surg. P. & W.	1891
Robinson. J. P., McCormick, S. C.	G. C.	1891
Reuling, Geo., 103 W. Monument St., Baltimore, Md.	Eye and Ear Surg. B. & O.	1891
Ross, W. Frank, Hot Springs, N. C.	R. & D.	1891
Rosborough, J. L., Senatobia, Miss.	I. C.	1891
Rowe, Wm. H., St. James, Minn.	C. St. P. M. & O.	1891
Rowland, P. W., Coffeeville, Miss.	I. C.	1891
Reynolds, O. C , Seward, Neb.	B. & M. R.	1891
Ristine, H. G., Fort Dodge, Ia.	I. C.	1891
Read, Edward W., Mandan, N. D.	N. P.	1891
Rader, W. H., Durango, Colo.	D. & R. G.	1891
Richings, Henry, Rockford, Ill.	C. & N. W.	1891
Richardson, W. D., Centralia, Ill.	J. S. E. Line.	1891
Riggs, Samuel M., Muscotah, Kan.	M. P.	1891
Reeve, J. T., 788 Lawrence St., Appleton, Wis.	C. & N. W.	1891
Riddell, Wm. C., Elkhorn, Mont.	N. P.	1891
Rouseville, A. P., Larimore, N. D.	G. N.	1891
Relyea, S. C., Ladonia, Tex.	G. C. & S. F.	1891
Rathbun, James P., Faulkton, S. D.	C. & N. W.	1891
Rucker, G. R., Eufaula, Ind. Ter.	M. K. & T.	1891
Robertson, Chas. G., Clarkston, Mich.	D. G. H. & M.	1891
Rickets, B. Merrill, 137 Broadway, Cincinnati, O.	Chief Surg. C. P. & V.	1891
Richards, Wm. M., 102 Richards St., Joliet, Ill.	C. R. I. & P.	1891
Rush, M. A., Goodland, Kan.	C. R. I. & P.	1891
Redus, W. D., Port Gibson, Miss.	L. N. O. & T.	1891
Rhodes, J. W., Tekoa, Wash.	U. P.	1891
Rixey, A. S., Culpeper, Va.	R. & D.	1891
Riggen, John A., What Cheer, Ia.	Div. Surg. B. C. R. & N.	1891
Russell, C. W., 55 S. Limestone St., Springfield, O.	Asst. Div. Surg. Big Four.	1892

NAME.	NAME OF RAILROAD.	DATE OF MEMBERSHIP.
Rothwell, John H., Liberty, Mo.	C. M. & St. P.	1892
Robison, Thos. C., Amsterdam, Mo.	K. C. Ft. S. & M.	1892
Ray, C. A., Winifrede, W. Va.	Chief Surg. Winifrede R. R.	1892
Reeve, Jas. S., Appleton, Wis.	M. L. S. & W.	1892
Rose, Walter A., Rochester, Pa.	C. & P. Div. Penna.	1892
Rushing, Stephen H.. Alexandria, La.	T. P. and H. C. A. & N.	1892
Roberts, W. O., 1041 Second St., Louisville, Ky.	Div. Surg. L. & N. and P. C. C. & St. L.	1892
Rosser, C. M., 234 Main St., Dallas, Tex.	H. & T. C.	1892
Rose, Henry G. C., Milbank, S. D.	C. M. & St. P.	1892
Rewalt, Luther L., Fulda, Minn.	C. M. & St. P.	1892
Reger, J. F., Littleton, W. Va.	B. & O.	1892
Riordan, Bruce L., 384 King St. W., Toronto, Can.	Chief Surg. Tcr. Div. G. T.	1892
Rogers, F. W., Hartford, Wis.	C. M. & St. P.	1892
Ray, A. R., Fairfield, Neb.	St. J. & G. I.	1892
Rownd, F. L., Dighton, Kan.	A. T. & S. F.	1892
Robinson, J. Franklin, 1037 Elm St., Manchester, N.H.	C. & M.	1892
Rogers, Orville L., Covington, Va.	C. & O.	1892
Straight, O. M., Bradford, Pa.	Chief Surg. A. & K., B. R. & P.	1888
Sanders, J. W., Kalispell, Mont.	Ex-Surg. B. & M.	1888
Shultz, J. B. Logansport, Ind.	C. St. L. & P. and T. H. & V.	1888
Stillings, F. A., Concord, N. H.	Chief Surg. Concord & Montreal	1888
Scott, Wm., Kokomo, Ind.	L. E. & W.	1888
Stemen, C. B., Ft. Wayne, Ind.	Wabash.	1888
Shuttee, H. C., West Plains, Mo.	K. C. F. S. & M.	1888
Stemen, Geo. C., 95 Calhoun St., Ft. Wayne, Ind.	Asst. Chief Surg. P. F. W. & C.	1888
Sommerville, J. A., Marinette, Wis.	M. & N.	1889
Stovall, A. M., Jasper, Ala.	K. C. M. & B.	1889
Sawtell, J. E. Gypsum, Kan.	M. P.	1889
Scott, Mathew T., Lexington, Ky.	Supervisory Surg. C. & O.	1889
Scott, John T., Holton, Kan.	U. P.	1889
Suggett, W. Le Grand, Flora, Ill.	O. & M.	1889
Sawhill, W. F., Concordia, Kan.	Asst. Surg. B. & M. R., M. P.	1889
Smith, E. J., Port Washington, Wis.	M. L. S. & W.	1889
Smith, C. A., Tyler, Tex.	Chief Surg. St. L. S. W.	1889
Stuart, D. F. Houston, Tex.	Chief Surg. H. & T. C.	1889
Sumner, J. B., Bloomington, Neb.	Asst. Surg. B. & M. R.	1889
Stewart, W. W., Clarksdale, Miss.	L. N. O. & T.	1890
Slager, J. L., Paulding, O.	C. J. & M.	1890
Scoles, J. P., Galena, Kan.	K. C. Ft. S. & M.	1890
Shidler, G. W., York, Neb.	Asst. Surg. B. & M. R.	1890
Shoptaugh, S. H., Princeton, Ind.	E. & T. H.	1890
Sims, W. A., Paragould, Ark.	Asst. Local Surg. St. L. & I. M.	1890
Sisler, L. E., Clinton, O.	C. A. & C.	1890
Smolt, Chas. F., Nickerson, Kan.	A. T. & S. F.	1890
Spilman, S. A., Ottumwa, Ia.	W. C. M. & St. P.	1890
Strickland, D. H., 134 W. Seventh St., Erie Pa.	E. & P.	1890
Stanton, T. P., Chariton, Ia.	C. B. & Q.	1890
Summers, H. S., Norfolk, Neb.	F. E. & M. V.	1890
Sibley, Chas. W., Fairfield, Ill.	L. E. & St. L.	1890
Stockwell, C. M., 927 Seventh St., Port Huron, Mich.	C. & G T.	1891
Strickler, O. C., New Ulm., Minn.	C. & N. W.	1891
Scott, Jr., Alex. H., St. Joseph, Minn.	Div. Surg. C. & W. M.	1891
Snook, J. M., 614 S. Burdick St., Kalamazoo, Mich.	Div. Surg. M. C.	1891
Smith, A. H., Avon, N. Y.	N. Y. L. E. & W.	1891
Scott, J. W., St. Charles, Minn.	C. & N. W.	1891
Sanford, Silas, Palmyra, Mo.	H. & St. J.	1891
Smith, W. J., Lykens, Pa.	N. C. & P.	1891
Shields, S. S., Carbondale, Pa.	N. Y. L. E. & W.	1891
Stephens, F. M., Robert Packer Hospital, Sayre, Pa.	L. V.	1891
Seward, J. J., 162 W. Eighth St., Erie, Pa.	P. & E.	1891
Smith, S. S., Emporium, Pa.	W. N. Y. & Pa.	1891
Snowball, Jas. W., Flemington, N. J.	Past Surg. L. V.	1891
Senn, N., 532 Dearborn Ave., Chicago, Ill.	C. K. C. & St. P.	1891
Smith, Chas. F., Danforth, Ill.	I. C.	1891
Smart, Edward N., Humphrey, Neb.	F. E. & M. V.	1891
Smith, Norman P., Paris, Ill.	T. H. & P.	1891
Smith, Irving W., Charles City, Ia.	I. C.	1891
Sutherland, H. H., Liberal, Kan.	C. R. I. & P.	1891
Stinson, J. B., Sherman, Tex.	T. & P.	1891
Shoffner, J. H., Water Valley, Miss.	Dist. Surg. I. C.	1891
Shoemaker, W. A., Dawson, Pa.	B. & O.	1891
Shine, M. L., Winthrop, Ia.	I. C.	1891
Sawyer, S. H., Eldon, Ia.	C. R. I. & P.	1891
Saunders. H. J., 244 Kings St., Kingston, Ont., Can.	Dist. Surg. G. T.	1891
Standly, Z. T., Laclede, Mo.	C. B. & K. C.	1891
Stout, Samuel H., Cisco, Tex.	T. P.	1891
Sarles, Wilber T., Sparta, Wis.	C. & N. W.	1891
Squires, H. S., Aguascalientes, Mex.	Asst. Surg. M. P.	1891
Stoddard, Luke F., Ramsey, Ill.	Div. Surg. T. St. L. & K. C.	1891

NAME.	NAME OF RAILROAD.	DATE OF MEMBERSHIP.
Stinson, C. H., Newark, O.	B. & O.	1891
Stine, C. H., 1916 Preston St., Louisville, Ky.	M. P.	1891
Saner, W. F., Hope, Ark.	St. L. I. M. & S.	1891
Sheffield, D. A., Apple River, Ill.	I. C.	1891
St. John, P. D., 120 E. Douglas Ave., Wichita, Kan.	C. R. I. & P.	1891
Scott, Stanhope M., Terre Alta, W. Va.	B. & O.	1891
Seymour, F. E., Fort Dodge, Ia.	M. & St. L.	1891
Spencer, C. E., Fort Gratiot, Mich.	Med. Officer G. T.	1891
Sawbridge, Edward, Stephenson, Mich.	C. & N. W.	1891
Sampsell, J. V., Elyria, O.	C. & L. W.	1891
Saunders, Bacon, Bonham, Tex.	T. & P.	1891
Stuart, J. R., 160 Texas Ave., Houston, Tex.	Asst. Surg. H. & T. C.	1891
Sanderson, Ira L., Sturgis, S. D.	B. H. and F. P.	1891
Stewart, Darwin A., Winona, Minn.	Chief Surg. G. B. N. & St. P.	1891
Smith, Jacob D., Shelbina, Mo.	H. & St. J.	1891
Scott, A. J., Loudenville, O.	P. Ft. W. & C.	1891
Suiter, F. C., 801 Rose St., LaCrosse, Wis.	C. B. & N.	1891
Shelton, J. A., Grayville, Ill.	P. D. & E.	1891
Slaughter, R. M., Belton, Mo.	K. C. O. & S.	1891
Syndor, C. W., Strasburg, Va.	R. & D.	1891
Shuey, W. A., Piedmont, W. Va.	B. & O.	1891
Summers, Chas. S., 404 Liberty St., Winston-Salem, N. C.	R. & D.	1891
Summers, J. E., 208 S. 15th St., Omaha, Neb.	C. R. I. & P.	1891
Shields, James M., Seymour, Ind.	E. & R.	1891
Spaulding, Geo. A., Avoca, Ia.	C. R. I. & P.	1891
Sherwood, Alfred C., Union City, Pa.	P. & E.	1891
Stauffer, H. R., Nappanee, Ind.	B. & O.	1891
Sawyer, John P., 89 Euclid Ave., Cleveland, O.	N. Y. P. & O.	1892
Smith, Courtney L., Aurora, Ill.	Div. Surg. C. B. & Q.	1892
Sanford, W. B., Corinth, Miss.	M. & C.	1892
Sprowls, J. N., Claysville, Pa.	B. & O.	1892
Schug, F. J., Tacoma, Wash.	U. P.	1892
Scott, C. M., Payette, Idaho.	Asst. Div. Surg. U. P.	1892
Sims, L. M., Kalama, Wash.	N. P.	1892
Schneck, J. S., Mt. Carmel, Ill.	C. C. C. & St. L.	1892
Sheridan, J. C., 166 Vine St., Johnson, Pa.	B. & O.	1892
Shirley, I. A., Winchester, Ky.	C. & O.	1892
Sterling, Geo. A., Sag Harbor, Long Island, N. Y.	Asst. Chief Surg. L. I.	1892
Shipps, Wm. H., Bordentown, N. J.	Amboy Div. Penna.	1892
Shores, Geo. W., Provo, Utah.	R. G. W.	1892
Stout, Abraham, Bethlehem, Pa.	L. V.	1892
Swartwont, H. B., Port Jervis, N. Y.	N. Y. L. E. & W.	1892
Speicher, Asa F., Elk Lick, Pa.	Pittsburgh Div. B. & O.	1892
Sperry, W. P., Phillips, Wis.	N. P.	1892
Stephens, James, Iroquois, Ontario, Can.	Dist. Surg. G. T.	1892
Schaufelberger, F. J., 713 Second St., Hastings, Neb.	St. J. & G. I.	1892
Smith, A. M., Beaver Springs, Pa.	Penna.	1892
Smith, W., Delphi, Ind.	L. N. A. & C.	1892
Stickney, V. H., Dickison, N. D.	N. P.	1892
Smyth, T. D., Palace St., Quebec, Can.	G. T.	1892
Schureman, I. C., Toms River, N. J.	Penna.	1892
Stover, J. M., Broadway, Va.	B. & O.	1892
Stockton, M. L., Gridley, Kan.	Santa Fe.	1892
Sabine, Andrew, Garden City, Kan.	A. T. & S. F.	1892
Shetler, S. J., Navarre, O.	C. C. & S.	1892
Scobey, W. E., 330 Dearborn Ave., Kankakee, Ill.	I. C.	1892
Steiger, Emil, Prairie du Chien, Wis.	C. M. & St. P.	1892
Smith, R. W. Bruce, Seaforth, Ontario, Can.	G. T.	1892
Smith, Ferd J., Alton, Ia.	C. & N. W.	1892
Scott, A. C., Temple, Tex.	Chief Surg. G. C. and S. N.	1892
Smith, F. P., Canton, S. D.	C. M. & St. P.	1892
Smith, T. H., Pomona, Cal.	S. P.	1892
Stealey, J. H., Freeport, Ill.	C. M. & St. P.	1892
Starkey, Herbert A., Harvey, Ill.	I. C.	1892
Strong, J. T., Plainfield, Ind.	Vandalia.	1892
Smith, C. S., Elroy, Wis.	Dist. Surg. C. & N. W.	1892
Shelly, S. T., Mulvane, Kan.	A. T. & S. F.	1892
Smith, Dan M., Jasper, Fla.	S. F. & W.	1892
Spaulding, S. M., Syndicate Block, Minneapolis, Minn.	N. P.	1892
Smith, Geo. S., Liberal, Kan.	C. R. I. & P.	1892
Stone, C. S., Wallace, Idaho.	Asst. Surg. U. P.	1892
Spence, C. J., Elmwood Place, O.	C. C. C. & St. L.	1892
Swift, Elisha P., Florence, Wis.	C. & N. W.	1892
Smith, Southwood, Garnett, S. C.	South Bound.	1892
Shellito, Amos G., Independence, Ia.	B. C. R. & N.	1892
Taylor, J. W., Huntsville, Mo.	Wab. West.	1888
Thorne, Samuel S., 506 La Grange St., Toledo, O.	Chief Surg. W. & L. E.	1888
Thompson, G W., Winamac, Ind.	Pan Handle.	1888
Thompson, G. T., Golden City, Mo.	K. C. Ft. S. & M.	1888

NAME.	NAME OF RAILROAD.	DATE OF MEMBERSHIP.
Tandy, T. S., Kinderhook, Ill.	Wab.	1888
Temple, A. B., Chetopa, Kan.	M. K. & T.	1889
Tidd, C. H., Geneva. Ia.	C. I.	1889
Tanner, H. B., Kankanna, Wis.	M. L. S. & W.	1889
Tenney, A. P., 540 Minnesota Ave., Kansas City, Kan.	M. P.	1889
Talley, H. A., Wentzville, Mo.	Wab.	1889
Toombs, R. S., Greenville, Miss.	L. N. O. & T.	1889
Troupe, A. W., 719 W. S. Ave., Pine Bluff, Ark.	Div. Surg. St. L. S. W.	1889
Tawler, S. S., Mariensville, Pa.	P. & W.	1889
Turner, E. M., Norton, Kan.	Ex-Asst. Surg. B. & M.	1889
Taylor, S. B., Blair, Neb.	F. E. & M. V.	1890
Terry, N. F., Lyons, Kan.	M. P.	1890
Thompson, Benj., Tama, Ia.	Div. Surg. C. & N. W.	1890
Thompson, A. A., Waxahachie, Tex.	M. K. & T.	1890
Thompson, W. A., Olney, Ill.	P. D. & E.	1890
Thomas, O. F., Chillicothe, Ill.	A. T. & S. F.	1890
Tiffin, Clayton, Hamilton. Mo.	H. & St. J.	1890
Tweedle. J. B., Weatherby, Pa.	L. V.	1891
Taylor, E. C., Kalamazoo, Mich.	Div. Surg. G R. & I.	1891
Thayer, H. W., Corry, Pa.	W. N. Y. & P.	1891
Turner, E. F., Leland, Miss.	L. N O. & T.	1891
Thompson, I. A., Traverse City, Mich.	G. R. & I.	1891
Trimmer, S. W., White Haven, Pa.	L. V.	1891
Taylor, H. M. Richmond, Va.	C. & O.	1891
Tobey, Carter McV., 362 E. 10th St., St. Paul, Minn.	W. C. and Con. Surg. G. N.	1891
Tuller, Willis M., Bowling Green, O.	D. & M.	1891
Thompson, C. Y., Beaumont, Tex.	S. P.	1891
Tarkington, Joseph A , 217 D St. N W., Washington, D. C.	B. & O.	1891
Taylor, Thos. L., Custer City, S. D.	Asst. Surg. B. & M. R.	1891
Thornton, T. F., Sturgis, Mich.	Div. Surg. G. R. & I.	1891
Trowbridge, J. B., Hayward, Wis.	C. St. P. M. & O.	1891
Treacy, Wm., Helena, Mont.	N. P.	1891
Truax, W. E., Breckenridge, Minn.	G. N.	1891
Trueheart, H P., Sterling, Kan.	M. P.	1891
Tope, J. W., 350 Lake St., Oak Park, Ill.	C. & N. W.	1891
Thornton, Van B., Hempstead, Tex.	H. & T. C.	1891
Travers, Edmund R., Amboy, Ill.	Dist. Surg. I. C.	1891
Thrush, Thos. B., Kansas City, Mo.	K. C. C. & S.	1891
Tye, R. P., Clarendon, Tex.	Asst. Surg. F. W. & D. C.	1891
Tomlinson, Oscar R., Tate Springs, Tenn.	M. & C. G.	1891
Titus, A., Portsmouth, O.	Div. Surg. C. & O.	1892
Terrell, E. A., Frederick's Hall, Va.	C. & O.	1892
Torbert, John S., Driftwood, Pa.	A. V.	1892
Tucker, H. G., Cromwell, Ind.	B. & O.	1892
Thompson, Benj., Landenburg, Pa.	Phila. Div. B. & O.	1892
Thayer, A. H., Grafton, W. Va.	B. & O.	1892
Talley, A. N., Columbia, S. C.	Chief Surg. C. L. & N.	1892
Turniss John P., 549 Lauderdale St., Selma, Ala.	A. & W. P. & W.	1892
Taylor, B. W., Columbia, S. C.	R. & D.	1892
Tate, H. W., Bolivar, Tenn.	I. C.	1892
Tyler, R. B., Joplin, Mo.	Mo. Pac.	1892
Underwood, M., Eldora, Ia.	C. I.	1888
Ulrich, Wm. B., Chester, Pa.	Chief Surg. P. W. & B.	1891
Umstad, H U., Phœnixville, Pa.	Penna.	1892
Vance, N. N., Bement, Ill.	W. L. S. & P.	1888
Van Meter, A., Lamar, Mo.	K. C. Ft. S. & M.	1888
Vincent, E. B., Sunman, Ind.	C. C. C. & St. L.	1888
Vanden, Geo., Caperton, W. Va.	C. & O.	1891
Vail, A. M., Rock Rapids, Ia.	I. C.	1891
Van Patton, Edwin H., Dayton, Wash.	Asst. Surg. U. P.	1891
Vankirk, W. F., Grafton, W. Va.	Chief Local Surg. B. & O.	1891
Van der Veen, A., Grand Haven, Mich.	D. G. H. & M.	1891
Vadakin, J. H., Bethany, Ill.	P. D. & E.	1891
Vest, W. E., Montezuma, Ia.	I. C.	1891
Valentine, Frank, Brooklyn, N. Y.	Chief Surg. L. I. R. R. Co.	1891
Vance, W. K., Bristol, Tenn.	E. T. V. & G.	1892
Vance. C. S., Cisco, Tex.	T. C.	1892
Vorhes, B. C., Lee, O.	T. & O. C.	1892
Vaughan, W. A., Timberville, Va.	B. & O.	1892
Van Kirk, B. H., West Newton, Pa.	B. & O.	1892
Wright, A. L., Carroll Ia.	Div. Surg. C. & N. W.	1888
Weaver, J. M., Dayton, O.	C. C. C. & St. L.	1888
Ward, W. A., Conneaut, O.	N. Y. C. & St. L.	1888
Wilson, J. H., Plymouth Ind.	L. E. & W. and P. Ft. W. & C.	1888
Will, F. J., Eagle Grove, Ia.	Div. Surg. C. & N. W.	1888
Wallace, John S., 1705 Lawrence St., Denver, Colo.	Wab. West.	1888
Wallis, R. S., Arkakelphia, Ark.	St. L. I. M. & S.	1889
Willson, Geo. C., Nevada, Mo.	M. P.	1889
Witherington, W. T., Paragould, Ark.	St. L. I. M. & S. and St. L. S. & W.	1889

NAME.	NAME OF RAILROAD.	DATE OF MEMBERSHIP.
Williams, O. A., Versailles, Mo.	M. P.	1889
Webster, E. E., 6827 Michigan Ave., St. Louis, Mo.	I. M & S. P.	1889
Wilson, Sr., B. F., Slater, Mo.	Div. Surg. C. & A.	1889
Wright, John W., 133 E. Spring St., Columbus, O.	C. & C. M.	1889
Willis, L. E., New Port, Ark.	St. L. I. M. & T.	1889
Whitten, E. M., Nebraska City, Neb.	Asst. Surg. B. & M. R.	1889
White, R. E., Norton, Kan.	C. R. I. & P.	1889
Walker, R. L., Mansfield Valley, Pa.	P. C. C. & St. L.	1889
Weissinger, W. S., Hernando, Miss.	I. C.	1890
White, L. R., Scandia, Kan.	M. P.	1890
White, Clarence H., Reed City, Mich.	Div. Surg. G. R. & I.	1890
Williams, A. O., Ottumwa, Ia.	C. R. I. & P.	1890
Worthington, D. H., Fairfield, Ia.	C. R. I. & P.	1890
West, T. H., Keyser, W. Va.	B. & O.	1890
Wright, John, Sardis, Miss.	I. C.	1891
Warfield, R. B., 214 W. Franklin St., Baltimore, Md.	B. & O.	1891
Weaver, W. G., Wilkes Barre, Pa.	L. V.	1891
Williams, H. J., 550 Orange St., Macon, Ga.	Ga. R. R.	1891
Williams, Geo. S., Muskegon, Mich.	Div. Surg. G. R. & I.	1891
Williams, J. R. White Pigeon, Mich.	L. S. & M. S.	1891
Warner, C. F., 620 Second St., Mankato, Minn.	C. & N. W.	1891
Williams, W. T., Mt. Carmel, Pa.	Pa. R. R.	1891
Webster, Wm. S., Liberty, N. Y.	N. Y. O. & W.	1891
Wood, J. K., Van Wert, O.	Pa. Co.	1891
Winkler, M. P., Tchula, Miss.	I. C.	1891
Watson, R. B., Lock Haven, Pa.	P. & E.	1891
Wheeler, H. C., Carbondale, Pa.	D. & H. Canal Co.	1891
Weidman, W. M., Reading, Pa.	W. & N.	1891
Workman, H. M., Tracy, Minn.	Div. Surg. C. & N. W.	1891
Wilson, C. G., St. Mary's, Pa.	P. & E.	1891
Wheeler, H. M., Grand Forks, N. D.	G. N. and N. P.	1891
Weist, J. R., Richmond, Ind.	Div. Surg. P. C. C. & St. L.	1891
Wooding, Benj. Frank, El Moro, Colo.	D. & R. G.	1891
Wagner, S. V., Bremond, Tex.	H. & T. C.	1891
Wilson, S. B. S., Olathe, Kan.	K. C. F. S. & M.	1891
Wallace, R. S., East Brady, Pa.	A. V.	1891
Woods, G. B., West Alexander, Pa.	B. & O.	1891
Williams, Walter L., Ridgeway, Pa.	B. R. & P.	1891
Wear, Isaac N., Columbia Hotel, Fargo, N. D.	N. P. and C. M. & St. P.	1891
Wilson, John G., Perth Amboy, N. J.	L. V.	1891
Wood, I. C., Logan, Ia.	C. & N. W.	1891
Watt, W. Neal, Burton, Tex.	H. & T. C.	1891
Wahl, G. F., Bremen, Ind.	B. & O.	1891
Wiley, T. W., McKinney, Tex.	H. & T. C.	1891
Waite, Ira W., Holyoke, Colo.	Asst. Surg. B. & M. R.	1891
Williams, W. W., Mattoon, Ill.	I. C.	1891
Warne, J. C., Cambridge, O.	Chief Surg. C. & M.	1891
Whitfield, A. J., San Luis Potosi, San Luis Potosi, Mex.	Div. Surg. M. C.	1891
Woolsey, Elliott H., Oakland, Cal.	S. P.	1891
Wilcox, Albert W., Laredo, Tex.	I. & G. N.	1891
Wiley, T. R., Gibson City, Ill.	I. C.	1891
Wireback, I. J., St. Petersburg, Pa.	P. & W.	1891
Wakefield, Wm., Lake Benton, Minn.	C. & N. W.	1891
Weeks, A. J., Correctionville, Ia.	I. C.	1891
Williams, R. R., Manning, Ia.	C. & N. W.	1891
Wallace, Hugh, Phillipsburg, Kan.	C. R. I. & P.	1891
Wilkerson, Marion, Sabina, O.	Local Con. Surg. C. & M. V.	1891
Wardell, J. Mearne, Cadillac, Mich.	Div. Surg. G. R. & I.	1891
Wade, D .W. C., Holly, Mich.	D. G. H. & M.	1891
Wysor, John C., Montgomery, W. Va.	C. & O.	1891
Woodworth, W. H., Corning, O.	T. & O. C.	1891
Whitehead, John, Salisbury, N. C.	R. & D.	1891
Wilkinson, Cary H., Galveston, Tex.	Chief Surg. G. C. & S. F.	1891
Wilson, Geo. W., Tipton, Ia.	C. & N. R. R. Co.	1891
West, W. B., Fort Worth, Tex.	H. & T. C.	1891
Witter, W. L. M., Milan, Mo.	C. R. & K. C.	1891
Williams, O. B., Andrews, Ind.	Wab.	1891
Wagley, T. J., Cleburne, Tex.	G. C. & S. F.	1891
Walker, J. O., Randleman, N. C.	R. & D.	1891
Warder, Jr., A. S., Grafton, W. Va.	B. & O.	1891
White, Joseph A., Richmond, Va.	C. & O.	1892
Willis, C. D., Greenville, Tenn.	E. T. V. & G.	1892
Webb, W. S., Northington, Minn.	B. & N.	1892
Watson, B. A., Jersey City, N. J.	Penna.	1892
Wilson, Jr., H. M., Pueblo, Colo.	D. & R. G.	1892
Weaver, W. Warren, 6300 Woodland Ave., Philadelphia, Pa.	B. & O.	1892
Whitefoot, Robt. M., Bozeman, Mont.	N. P.	1892
Wheaton, C. A., 326 Wabasha St., St. Paul, Minn.	Chief Surg. St. P. & D.	1892

NAME.	NAME OF RAILROAD.	DATE OF MEMBERSHIP.
Wilkes, B. A., Bowling Green, Mo.	C. A. & St. L. and St. L. & H.	1892
Wagenseller, B. F., Selin's Grove, Pa.	Con. Surg. Lew. Div. Penna.	1892
Wilson, Benj. R., Titusville, Fla.	J. T. & K. W.	1892
Wylie, Samuel M., Paxton, Ill.	Div. Surg. L. E. & W.	1892
Woods, D. L., Dighton, Kan.	A. T. & S. F.	1892
Wood, M. L., 301 Church St., Montgomery, Ala.	A. M. & S. A. M.	1892
Woodward, C. M., Tecumseh, Mich.	C. J. & M.	1892
Weedman, Chas. B., Nova, O.	B. & O.	1892
Williams, W. H., Wall Lake, Ia.	C. & N. W.	1892
Wight, D. W., Pomeroy, Ia.	I. C.	1892
Wagner, J. K., Van Horne, Ia.	C. M. & St. P.	1892
Warren, L. J., Clay Centre, Kan.	C. R. I. & P.	1892
Whitford, H. K., Elgin, Ill.	C. M. & St. P.	1892
Wedge, A. C., Albert Lea, Minn.	C. M. & St. P.	1892
Waste, J. P., Plainview, Minn.	C. & N. W.	1892
Wilson, D. J., Baird, Tex.	T. & P.	1892
Wade, C. F., Los Baunos, Cal.	Div. Surg. S. P.	1892
White, C. A., Danville, Ind.	I. & St. L. Div. of Big Four.	1892
Williams, J. Cal, What Cheer, Ia.	C. & N.W.	1892
Winton, Chas. F., Washington, Ind.	O. & M.	1892
Young, Geo. M., Evansville, Ind.	Chief Surg. E. & T. H.	1889
Yancy, Edwin F., Sedalia, Mo.	Chief Surg. M. K. & T.	1889
Young, Theo. J., Titusville, Pa.	W. N. Y. & P.	1891
Yates, Oscar E., Holland, Mich.	C. & W. M.	1891
Young, J. W., Bloomfield, Ia.	Wabash.	1891
Young, Robt. S., Concord, N. C.	R. & D.	1891
Young, Seymour B., 48 4th East St., Salt Lake City, Utah.	Chief Surg. Utah Central.	1892
Zwetsch, J. D., Gowanda, N. Y.	B. & S. W.	1891
Zern, J. G., Lehighton, Pa.	L. V.	1891
Zimmerman, H. A., Youngstown, O.	P. Y. & A.	1892

Total membership in good standing to March 1, 1893, 1,421.

NOTE.—The date of the year is the year of the Association and not the calendar year. Thus, "1891" applies to all members who joined after the annual meeting of 1891, and before that of 1892. Similarly "1892" applies to members who joined in the first two months of the current calendar year.

◆

LANE MEDICAL LIBRARY

To avoid fine, this book should be returned on or before the date last stamped below.

FO SE.

ANTISEPTIC,
PROPHYLACTIC,
DEODORANT.

ON-TOXIC,
ON-IRRITANT,
ON-ESCHAROTIC.

FORMULA—Liste , Gaultheria and Mentha Ar ed and purified Benzo-bora
DOSE—Internally ngth, or diluted, as necessary

LISTERINE y adapted to internal use, a treatment of all parts of the simple local application, a the field of

PRE S.

Disea sis.

LITH GEA

FORMULA—Each fl DRANGEA and three grains ed process of osmosis, it is n be depended upon in clinic
DOSE—One or two

Urinary Calcul tis, Hæma-

We have much valuabl d to Physicians literature upon n request:

LAM

ARTIFICIAL LIMB MFG. CO.

(Incorporated by the State of Pennsylvania.)

Manufacture Adjustable Lacing Socket Legs.

The most comfortable and durable limb, and nearest approach to the natural member, of any invention of the age. Made by men who wear them and appreciate their advantage. We are authorized to make limbs for soldiers on government orders.

909 PENN AVENUE,
(NEAR 9TH ST.) PITTSBURGH, PA.

Railroad men and others will please write for descriptive catalogue. Address all communications to

J. W. THOMSON,

Who has been the chief representative of this Company for more than 20 years.

RD
93
N38
v.5
1892
STEAM

ARTIFICIAL LIMBS.

Amputation Above Knee, = =	$65.00
Knee Bearing Limb, = = =	65.00
Amputation Below Knee, = =	60.00
Amputation Below Knee Without Thigh Support, = = = =	40.00
Chopart Apparatus, = = =	40.00

We Make a Specialty of Expert Fitting in all Cases, and the Limb for Lower Amputation without Thigh Support in Particular. Send for Circular.

GEO. H. MICKEY,

Rooms 3 and 5 Carlton Block, No. 9½ Woodland Ave.,
CLEVELAND, OHIO.

CAMPHO-PHENIQUE.

$(C_8H_{11}O)$

FOR PROFESSIONAL USE ONLY.

Local Anæsthetic, Antiseptic, Germicide and Parasiticide.

ABSOLUTELY NON-IRRITANT.

A True Chemical Combination of Refined Camphor and Pure Chlorophenic Acid,

It prevents suppuration in fresh wounds, whether incised or lacerated, and controls it in wounds in all stages; its local anæsthetic property *abolishes* or obtunds *pain* almost immediately, two qualities which, combined, make it the *most effective antiseptic vulnerary and dressing* yet offered to the Medical Profession.

CHLORO-PHENIQUE.

$(C_6H_4(OH)Cl)$

A Chemical Compound of Chlorine and Phenic Acid. An Antiseptic and Antizymotic, for Internal and External Use, miscible with water in all proportions.

DIANIN discovered and investigated the antiseptic properties of compounds of chlorine and phenol, and demonstrated them to be of the very highest order. In **Chloro-Phenique** we claim that we have the most powerful and valuable antiseptic and antizymotic of the entire series, being certain in action and non-poisonous and non-irritant.

Being soluble in water in all proportions, **Chloro-Phenique** is offered to the Medical Profession as an agent available in all cases where Bichloride of Mercury and Carbolic Acid have hitherto been used, and superior to either of them, in that it is non-poisonous and non-irritant.

We solicit the most careful and searching examination of its merits. Literature sent free and samples to any reputable physician willing to pay express charges. Address,

PHENIQUE CHEMICAL CO.

514 ELM STREET, ST. LOUIS, MO.